An Investigation into the Influence of Learning Styles and other Factors Affecting Students' Perception of Virtual Learning Environments

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ABSTRACT

In order to explain and determine the attitudes and factors affecting perceptions of students to adopt and use Virtual Learning Environment (VLE) as a tool in complementing and supplementing face-to-face learning, this research combined two theoretical models: Technology Acceptance Model (TAM), one of the more popular acceptance models, and Learning Style Inventory (LSI). The Technology Acceptance Model is one of the models used to study the problem of low adoption or underutilization of technology while learning styles model adopted in order to determines the preferred learning styles for the users of VLE.

This study investigates students at Tripoli University, the main University in Libya to understand their perceptions of using VLE with respect to their learning styles. The study used a quantitative descriptive research design method by using a survey as the primary means of data collection. Empirical data were collected from different departments and schools (n=302) to examine the impact of specialisation construct. The study proposed a conceptual model which includes external variables derived from previous research, the core TAM model combined with learning style as an independent variable in order to determine the impact of learning styles on the perception of students towards VLE use. A combination of *t* tests, ANOVAs, chi-squares, and Pearson’s product-moment correlation coefficients was used to analyse the data by using two techniques: single and multiple regressions. Findings from the quantitative data revealed that, regardless of gender or learning styles impacts, the participants have a strong positive behavioural intention to use VLE tools in their existing learning environment. The results of this study implied that gender and learning styles did not play a significant role in determining perceptions and usage of VLE. However, the other defined independent variables had significant effects on the model and contributed to the explanation of the model except for example, job relevance, complexity factors. The interesting result found in this study was the fact that the specialisation constructs shows that there is a different level of VLE use depending on the student's specialisation, namely that natural and formal science students showed the most interest in using the new technology. Another interesting outcome found that students' perceived ease of use demonstrated a more consistent influence compared to usefulness in determining the usage of VLE. This finding is new and is inconsistent with most previous research. Although, the results show that there is no significant impact of learning styles on the research model, the results, however, show learning styles can play a very important role as a moderating factor between beliefs constructs and external variables. The results of the coefficients were not the same for each learning style, which may indicate that different learning styles moderate the relationships between variables involved in the research model (VLEAM). The people with the highest coefficients were those with the assimilator style compared to other learning styles, followed by divergent/accommodator convergers. This means that assimilators are the best target learners for VLE. However, the results show that female assimilators have more negative impact on PU, meaning that they regard VLE as being less useful. The parameters in the model may be altered for each learning style to get the maximum benefit from the model.

From a theoretical and methodological perspective, it was found that TAM being a simple psychological model was not good enough to explain broader systems such as VLE and subsequently has not fully explained students' perceptions towards use. In the light of the findings, the study suggested that a study of adoption and acceptance technology should move from using a simple psychological TAM model to another form that is able to measure IS that contains complex functions.

The outcomes of the study are beneficial to decision makers at the university level when making decisions about technologies that affect the teaching and learning process as well as assisting in institutional decision in regards to where to commit resources (technology, monetary, labour, etc.) to implement and maintain those systems.

KEY WORDS

VLE, E-learning, IS models, TAM, Learning Styles LSI,

USED ACRONYMS / ABBREVIATIONS

AC	Abstract Conceptualisation
AE	Active Experimentation
ATT	Attitude towards of use
App	Professional and applied science
AVE	Average Variance Extracted
BECTA	British Educational Communications and Technology Agency
BCMS	Blackboard Course Management System
BI	Behaviour Intention
CCSR	Centre for Computing and Social Responsibility
CE	Concrete Experience
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CLS	Collaborative Learning Software
COMP	Compatibility
CSA	Riding's Cognitive Style
CX	Complexity
DLS	Dunnand Dunn Learning Styles Inventory
DOI	Diffusion of Innovation Theory
DTPB	Decomposed Theory of Planned Behaviour
E-learning	Electronic Learning
EFA	Exploratory Factor Analysis
EXP	Experience
FE	Further Education
GDP	Gross domestic product
GEFT	Group Embedded Figures Test
GRLS	Grascha-Riechmann's Learning Styles Questionnaire
GFI	Goodness-of-Fit Index
GLS	Generalized Least Squares
GOF	Goodness-of-Fit Measures
GSD	Gregorc's Mind Style Delineator
HBDI	Herrmann's Brain Dominance Instrument
HE	Higher Education
ICT	Information and Communication Technology
ILS	Felder-Silverman Inventory of Learning Styles
IS	Information System
ISPs	Internet Service Providers
ISU	Internet Services Unit
IT	Information Technology
JISC	Joint Information Systems Committee
JR	Job Relevance
KMO	Kmo and Bartlett's Test
LS	Learning styles
LCMSs	Learning Content Management Systems
LES	Libyan Education Sector
LMSs	Learning Management Systems
LRI	Libyan Research Institute Organisation

LSP	Jackson's Learning Styles Profiler
LSQ	Honey & Mumford's Model
MBTI	Myers-Briggs Type Indicator learning style
M.I.	Modification Indices
MMS	Multimedia Message Services
NFI	Normed Fit Index
Ns	Natural And Formal Science
PBC	Perceived Behavioural Control
PCA	Principal Components Analysis
PCI	Perceived Characteristics of Innovating
PEOU	Perceived Ease of Use
PLS	Partial-Least-Squares-Based
PU	Perceived Usefulness
RMSEA	Root Mean Square Error of Approximation
RMSR	Root Means Square Residual
RO	Reflective Observation
SE	Self-Efficacy
SEM	Structural Equation Modeling
SN	Subjective Norm
SP	Specialisation
SPSS	Statistical Package for the Social Sciences
Ss	Social Science
TAM	Technology Acceptance Model
TLI	Tucker Lewis Index
TNET	Trust in Internet
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of Acceptance and Usage of Technology
VARK	Fleming's VARK Model
VILS	Vermunt's Inventory of Learning Styles
VLEAM	Virtual Learning Environment Acceptance Model
WAP	Wireless Application Protocol
α	Cronbach's Alpha's

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1 INTRODUCTION

1.1 INTRODUCTION AND RESEARCH BACKGROUND

A Virtual Learning Environment (VLE) is a web-based system designed for education matters involving a set of tools, which will assist in the learning process through known websites or via the internet (Ofsted, 2009). In the UK, the Joint Information Systems Committee (JISC) has defined VLE as, "An electronic system that can provide online interactions of various kinds that can take place between learners and tutors, including online learning" (JISC, 2009, p.1).

The benefit of installing such a system for the purpose of education has been studied by many researchers. For example, Becta (2004, p1)presents a number of benefits of VLE such as, "An anytime, anywhere access, improved motivation, access to higher or novel learning styles, opportunities for independent learning, better integration of information and communication technology (ICT) tools and increased parental engagement."

With this in mind, it has been identified in the literature that VLE is beneficial and can help in the growth of the institution reducing costs, as it allows both synchronous and asynchronous interaction amongst students and also between students and teachers. Importantly, VLE's provide quality education and deliver courses anywhere and at any time (Allen & Seaman, 2005; Leslie, 2005; Bell & Heinze, 2004; Schroeder, 2003; Valenta *et al*, 2001).A study conducted by Bell *et al*.(2007) asked how virtual mobility can be of benefit to students and users of higher education. The study's findings emphasised student perceived support and collaboration offered by Collaboration Across Borders (CABWEB) and Enhancing Student Mobility through Online Support

(ESMOS) were beneficial and support students in their studies. Moreover, approximately 85% of students strongly agreed that collaborative activity was beneficial to their education (Bell *et al.*, 2007). Although VLE projects are expected to provide great benefits to educational organisations; the literature shows that most studies focused on studying the phenomenon in terms of the experience and usage of both web-based learning or VLE, comparative studies on VLE as an online method compared with traditional ones, the interaction of users within online environments and the integration of the use of VLEs to develop teaching strategies that assist students in terms of learning outcomes. Furthermore, there are no such studies that have investigated VLE adoption from the viewpoint of the theories of technology acceptance models. The Existence of such studies is important and can provide educational organisations a wide range of benefits which are upgrading course contents, develop discussion board and planning strategies of teaching by using online learning.

Research indicates that the learning style preferences are very important for online education. This new technology will only be effective if personal learning styles are adapted (Bechter and Esichaikul, 2008). Irrespective of online learning benefits and its rapid spread in higher education, particularly in developed countries, its effect is not yet satisfactory (Lu *et al.*, 2007). In this context, the literature illustrate that some students still complain about insufficient resources to maintain their online course when they interact with online learning. Others felt confined by the lack of communications with their tutors (Huang, 2003). To cover these issues, for example, Liegle and Janicki (2006) argue that to satisfy student concerns online modules should be customised according to students' learning styles. With respect to the importance of learning styles in education, this study differs from other ones by involving learning styles in the acceptance process of VLE in order to understand the perceptions of students towards using this technology. This approach is particularly apt for this research as the software is still in its infancy in developing countries particularly in Libya. It is felt very important to measure the perceptions because students do not have prior experience of this kind of technology since VLE is not ubiquitous in developing countries.

1.2 THE PURPOSE OF THE RESEARCH

As noted earlier, it is important to investigate the relevant factors that affect the adoption of VLE with respect to different student learning styles from the viewpoint of the learner. Housego & Freeman (2000) confirmed this view and stated that most previous research studies are carried out in terms of the general experiences of using the internet and not with particular attention to the various VLEs or web-based learning tools studies that are available.in addition to recent studies have not recognized the importance of relevant factors related to the adoption of VLE such as, those of (Parker, 2003; Poon *et* al., 2004;Fahy, 2005; Lu *et al.,* 2007; Graf, et al., 2009).Moreover, such studies do not demonstrate information concerning the factors influencing the usage of VLE users. For instance, in the comparative studies of Hall (2001), Sandercock & Shaw (1999) and Fallah & Ubell (2000), which focused only on comparing the delivery of courses through online measures as opposed to traditional methods, only general information about the advantages and disadvantages of both methods were provided. Notably, although these studies have provided knowledge and understanding about the performance of VLEs compared to traditional methods, there has been a failure to study the system's acceptance in terms of different learning styles and how these differences impact on students' attitudes and use of it.

Another stream of studies focussed on interaction within online environments, such as, (Silva, 2004; Picciano, 2002; Sorensen& Takle, 2002). Other studies have investigated the effect of integrating VLEs to develop teaching strategies (Housego & Freeman 2000;Berry 2005; Weller 2006 and 2007). Whilst such information is useful and provides a base for future strategies to improve the quality of the online education environment, the perceptions of the usage and the impacts of factors were not discussed. These studies do not report the importance of the factors known to influence students' usage of the VLE. Consequently, this gap should be addressed.

Although numerous studies utilised technology acceptance of VLE and E-learning, such as, Poelmans *et al*. (2008), Poelmans *et al*. (2009), Weller (2007), Miouser *et al*. (1999), Vrielink (2007), Van Raaij *et al*. (2008), Doyle *et al*. (2010), Jiang & Ting (1998), Joanne *et al*. (2005), Lingard (2007), Smith & Stephens (2010), Sorensen & Takle (2002), Liu *et al*. (2009), Chang & Tung (2008), Floyd (2010), Keller (2009), and Neuforn (2007) none of these studies investigated VLE acceptance from the student's viewpoint in the light of this theory, Particularly, with respect of students' learning styles. Lee *et al*. (2008) defines learning styles in terms of how information is processed, as well as how it is perceived. According to NASSAP (1979, p 6), "Learning style is characterized as cognitive, affective and psychological behaviours that indicate how learners perceive, interact with and respond to the learning environment."

In the traditional classroom environment, educators are no longer interested in the interaction between teaching methodologies and learner experiences (Beadles & Lowery, 2007). This leads to a shift from cognitive styles to learning styles as learners respond to the learning environment. The importance of a preferred learning style is that it acts as a significant factor that helps the researcher to understand the attitudes of students towards their learning and interaction with advanced education using technology. Learning styles may contribute towards our suggested research model combined with other external factors that assist in evaluating the acceptance or rejection of technology amongst students using a VLE system, particularly in the Libyan context, which differs from other cultural settings where usually acceptance and adoption theories have been developed and measured (Struab, *et al.*, 1997).

According to the researcher's knowledge, there is only one study by Swesi (2008) that focussed on predicting the applicability of using technology acceptance model theory (TAM) in Libya. The study investigates the robustness and appropriateness of the model in the Libyan culture setting. This can not only support and assist but also provide a base to design and develop a theoretical model for student adoption of VLE that includes the affects of learning styles and is capable of answering the research questions, which aim to guide the present research.

1.3 RESEARCH QUESTION

As mentioned earlier, further research will be needed in order to develop a better understanding of the factors that influence student acceptance of VLEs and to ensure smooth implementation and effective utilisation of the underlying technology within a university's learning environment. As a result, there is the need to investigate how instructional technologies, such as VLEs, can be accepted and utilised in order to improve and enhance the overall teaching and learning process. With this in mind, this particular study aims to gain insight into students' perspectives, specifically those attending the Tripoli University, the main and largest university in Libya, with respect to the use of a Blackboard Course Management System (BCMS) as part of a VLE. Thus, this study is presented in order to assess the effects of VLEs in terms of their usefulness and ease of use based on student learning styles and other factors that affect the acceptance and use of this new instructional technology. As this study treats ‘learning style’ as the main factor, this was added to the suggested research model presented in chapter five. It is considered an independent variable for the exploration of its impact on the acceptance of VLEs. With this objective in mind, the research questions underpinning this study are formulated as follows:

1) What are the perceptions of the students, their attitudes toward and behavioural intention to use Blackboard’s Course Management System (BCMS), based on their learning styles?
2) What are the roles of specialisation constructs and the impacts of learning style on the acceptance of the new technology (VLEs) amongst Libyan university students?
3) Are there any significant relationships between gender group and learning styles?
4) What are the impacts of learning styles on the factors related to the TAM?

In order to answer these research questions, a conceptual model has been developed and used to explore and assess the defined factors that are known to influence student acceptance of VLEs. Based on the research questions, the researcher developed the research hypotheses that will assist in addressing the objective of this study. The findings of the present research will help decision-makers and administrators to gain an understanding of the crucial factors that could assist the process of efficient adoption. In terms of Information System (IS) theories, particularly Technology Acceptance Model (TAM), it is believed that this will serve as a base model to help in developing this research model. The hypotheses and the research model are described in detail in

Chapter Five along with the research's design presented in chapter seven, which will assist to test the hypotheses and subsequently validate the research model. Moreover, with regard to addressing the gap in the literature, the next section will describe the contribution that this research makes in terms of building upon the existing literature in the IS field, particularly in terms of acceptance and adoption.

1.4 RESEARCH CONTRIBUTION

This research investigates the importance of how learning styles impact on the acceptance of VLE. Notably, as stated by Arif (2001), students and staff might not be prepared or ready to use a VLE because it is a new system for developing countries, such as, Libya. The literature states that this could be one reason for its low usage. With this in mind, Al-Gahtani (2008) points out that users' acceptance of IS is considered to be the main issue in striving to achieve the successful implementation of a new system of technology, particularly when it involves participants having to negotiate a relatively large unfamiliar structure. Accordingly, acceptance should be influenced by the perceptions of users. Therefore, the perception of students towards new technology usage is considered to be a vital factor and one which should be surveyed and researched so as to obtain an accurate picture and to assist in the level of acceptance and preparation in relation to the new technology prior to its installation.

As was mentioned earlier, this research aims to investigate students' perceptions of VLE utilisation; therefore, the findings of this research will add to the literature by:

1- contributing by explaining the factors that could influence students' acceptance of VLE (Blackboard) use within a university environment;
2- establishing the role of learning style models to understand the perceptions of students and their moderation with regard to other factors;

3- understanding how the development of the Virtual Learning Environment Acceptance Model (VLEAM) serves as a conceptual model that may help with future research;
4- determining the roles played by the specialisation construct in predicting acceptance and explaining variance; and
5- highlighting the essential implications for both administrators and decision-makers in terms of adopting such systems by reviewing the results

1.4.1 PROGRESS BEYOND PREVIOUS RESEARCH

Whilst the present research is based on the previous research of Swesi (2008) and other TAM studies, it is, however, a significant theoretical and empirical extension for the development of a new conceptual model. In Swesi (2008), the applicability of the Technology Acceptance Model (TAM) was tested in a Libyan context with the use of external factors with focus on Internet use. Having found this to be applicable, the purpose of Swesi's (2008) study was to explore the applicability of TAM as a response to calls to study its robustness in other cultural settings. Notably, Hofstede (1994) posits that many social science theories are culture-centric and according to Straub, Keil &Brenner (1997), "Given the on-going rapid globalization of business and systems, there is a pressing need to learn how widely TAM applies in other cultures around the world." (p. 1)

Straub *et al*. (1997) tested the TAM in three countries, the findings of which indicate that the TAM holds for Switzerland and the US but not for Japan. The motivating point for the previous study (Swesi, 2008), therefore, is to be able to examine the robustness of the TAM in a Libyan context.

Secondly, in this regard, there is no definite knowledge of the attitude of students in Libya with respect to the use of technology (i.e. the internet) owing to an absence of studies surrounding internet usage in Libyan universities or studies which otherwise give an idea of the general attitude toward the adoption of new technology. Thus, the study provides an opportunity to test the capability of the model in a new context and thereby provide new literature in a Libyan context.

Importantly, empirical data has been collected from Libyan university students in order to assess the explanatory and predictive power of the proposed model in a different cultural setting with the use of eight external variables: age, gender, subjective norms, job relevance, self-efficacy, experience, complexity and a new variable, specialisation (Major). The study held that the model applied in Libya; however, some variables had no effect upon the model, all of which have led to reducing its variance.

The findings of the previous study and the gap that exists in the literature, as described earlier, has encouraged the researcher to investigate the factors that may influence students' use of new technology implemented in the university (VLE). The literature has been extensively reviewed in terms of the factors that were investigated by previous studies. There is, however, a gap in the IS research, which is the perception of students towards usage of VLE based on preferred learning styles. This is a significant omission, as VLE is considered an important application in the arena of education. In the present study, the researcher proposes a model based on the previous study but which is completely different from what has been previously done. The present study, therefore, is based on the ideas of the previous one in terms of its theoretical theory (TAM) background but its aim and the purpose (as discussed earlier on in Chapter One) is different. This study seeks to investigate the perceptions of students towards the useof

VLE as a new application in a new environment with the purpose of enhancing education. In order to cover this gap, the researcher proposes conceptual model (Chapter Five), by integrating a learning styles model into the one of Swesi's (2008) study. Importantly, this is because the model has already been tested in the Libya context.

In terms of the purpose of the present research, the model has been developed by integrating it with learning styles for the purpose of specifically analysing the acceptance of learning technology, namely, virtual learning environments. In this research, a completely new set of data has been collected and analysed comprehensively, as described in Chapter eight. Importantly, although there were various limitations associated with the previous study owing to various procedures not being taken into account, as well as some mistakes encountered during data collection, some very important lessons have been learnt, for example, the distribution of the survey, the understanding of the terms used in the survey and the instrument used were new to students in Libya. This caused a lack of respondent understanding and approximately 20% of questionnaires were incomplete and, therefore, discarded. As a result, a slightly low response rate was established, which was considered due to the sudden distribution of the survey, which meant the respondents lacked understanding before the survey was given. The entire process and the limitations encountered in the present research are described in Chapter Six.

1.5 THESIS OUTLINE

The introductory chapter outlines the purpose of the study and its importance while indicating previous and recent research that relates to IS acceptance. This is followed by the research questions, which were formulated based on the aim and the objective of the research. The contribution of the present research is described including an introduction of its progress and how it reached beyond previous work in this field. Figure (1.1) presents the research outline. The researcher decided to divide the literature review into three chapters in order to gain a comprehensive understanding of the adoption process. Consequently, the chapters two, three and four represent the literature review.

Chapter Two provides a general literature review about VLE adoption in higher education. The overview includes an introduction to VLE, its users, previous research, the area of perception and usage and the measurement of IS acceptance. This information will guide the research in developing the present model, the measurement and conduct of the research.

Chapter Three contains a review of the literature of IS theories and models, including Theory of Reasoned Action TRA, Theory of Planned Behaviour TPB and Technology Acceptance Model TAM. These models are described in detail including their strengths and weaknesses. They are then compared with other models to ascertain their suitability for the purpose of this research. This included critical review of TAM and a justification for its use in the present study. Importantly, a review of its original constructs, as well as of the antecedents of 'constructs of belief', namely, gender, subjective norms, specialisation, job relevance, self-efficacy, experience and complexity will be provided.

Chapter Four contains a review of the literature of the second model involved with the conceptual research model for this research, namely, Learning Style Models. This review included descriptions of several popular learning style models that are found in the literature. A comprehensive review of these models and their respective instruments were thus presented. In addition, these models were compared in order to extract their criteria thought to be suitable for this research. The critiques of the chosen model are also presented for the purpose of this research.

Chapter Five describes the information surrounding the theoretical framework (research model) and presents the developed model for the purpose of this research. The rationale behind using TAM, a research model (VLEAM) and research hypotheses that is formulated based upon the research questions and the research model is discussed.

Chapter Six presents the research methodology appropriate for this study. The research methods quantitative and qualitative were presented as possible choices. Methodological justification and topic challenges were described. The outcome of the research was presented. Methods for sampling were discussed including the technique adopted by this research.

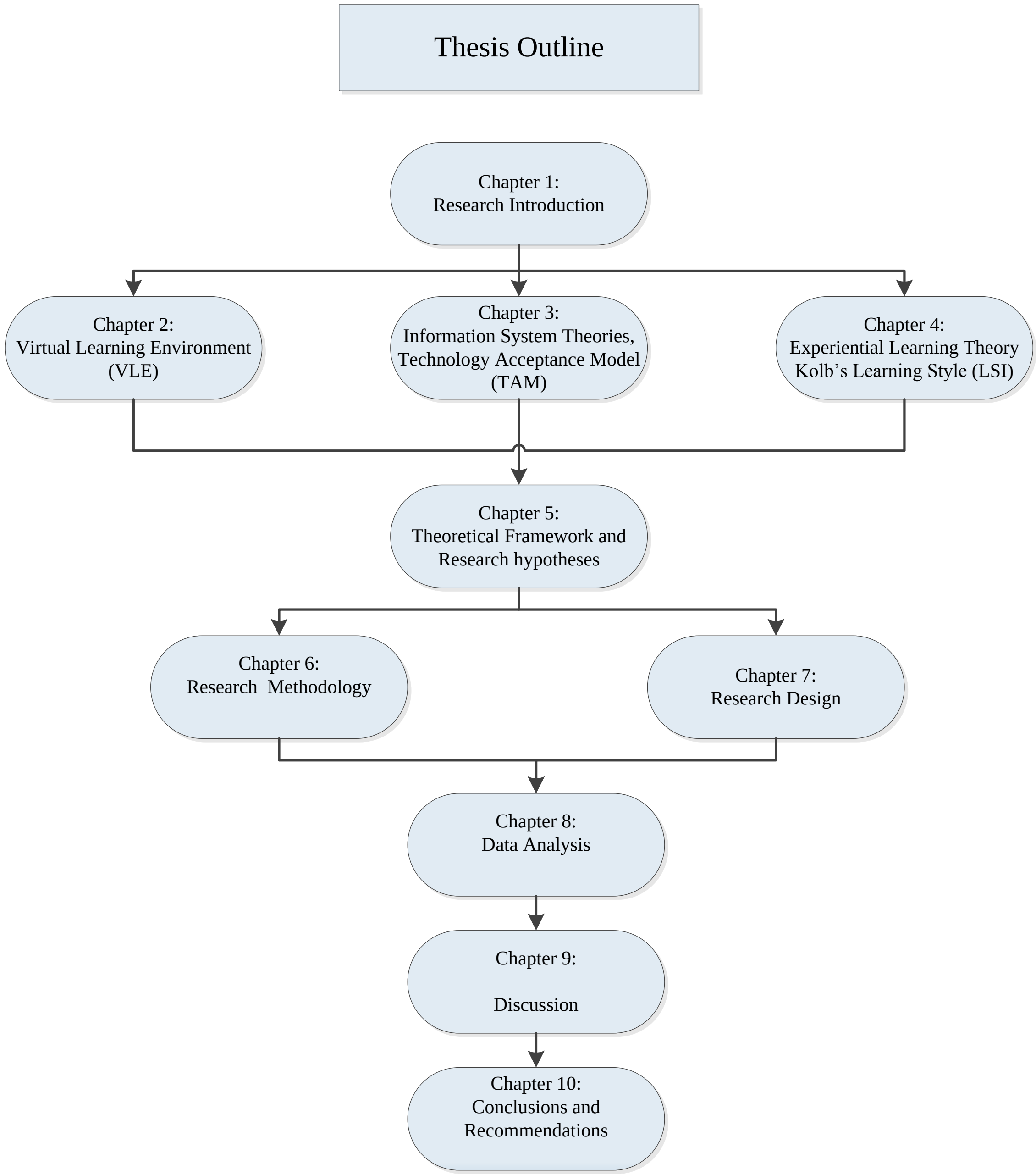
Chapter Seven details the research's design that was used to carry out the research, including its typology. An overview of the research method was described. The chapter provide all details for the design of the instrument, operationalization of the constructs, and description of learning styles instrument. The process of translation of the instrument was presented, and the ethical concerns were also provided. Target respondents and participants response was discussed in this chapter. The process of pilot study was conducted and explained. Finally, the actual study demonstration was discussed.

Chapter Eight outlines the data analysis and results which include a questionnaire analysis, discussion of the reliability and validity of the constructs, a factor analysis and a description of the demographics and statistics, and the techniques used for testing the hypothesises. Finally, the hypotheses were tested by the use of two different methods, namely, single and multiple regression techniques. In addition to, predictive path model was discussed.

Chapter Nine provides a discussion of the findings based on the data analysis in chapter eight, which included hypothesises explanations. The discussion chapter divided into three parts, TAM constructs, external variables relationships and learning style impacts. The chapter provided a summary of the tests applied to hypothesise. Finally, the chapter details the research model's VLEAM fit with final suggestions for pathways for the variables.

Chapter Ten outlines the research's conclusions based on a discussion of the findings and the chapter's response to the research questions. Finally, the chapter describes the contribution the research has made to knowledge, identifies and describes the limitations of the study and the scope for future work.

Figure 1-1 thesis outline



2 VIRTUAL LEARNING ENVIRONMENT

2.1 INTRODUCTION

This chapter provides information relating to the context of the current research. It presents the first part of the literature review as detailed in chapter one. The discussion of this chapter centres around three domains as follows:

- VLE in relation to higher education development
- Virtual Learning Environments (VLEs) researches
- higher education and technology in Libya

The chapter commences by discussing VLE as the application that is implemented in higher education. Subsequently, the chapter will provide information concerning the utilisation of technology in higher education in Libya, where the research takes place. Issues related to gender and experiences of Libyan students in relation to the use of technology are considered. Moreover, the chapter provides important information about VLE research, its users, usage and students' perceptions as well as literature on how VLE has been treated.

2.2 VIRTUAL LEARNING ENVIRONMENT

"A VLE is a software tool, which brings together in an integrated environment a range of resources that enable learners and staff to interact online and includes content delivery and tracking" (Becta, 2003a, p.1). In the view of Poelmans *et al*. (2008), an online learning or virtual learning environment (VLE) is a multimedia tool utilising information and communication technology and the worldwide web in order to provide educational solutions, support education and training for both teachers and students alike. Furthermore, it is stated by Weller (2007) that a VLE may be considered a computer application, adopted on a network basis, which facilitates learning irrespective of location.

Alternatively, a VLE may be described as an online application providing various authoring tools, thus enabling individuals to learn via the internet. Moreover, Mioduser*et al*. (2000) stated that the introduction of VLEs has come because of educational professionals striving to combine internet technology with academic objectives. Virtual learning environments have also been given different names, such as, collaborative learning software, learning content management systems (LCMSs), learning management systems (LMSs), online learning platforms and web-based learning environments.

In the context of business, it is also important to highlight that VLEs may be considered either commercial or non-commercial, both of which comprise a number of different authoring tools in order to enable the establishment of appropriate online learning environments. Notably, each of these tools fulfils a specific purpose, such as, assignment submissions, collaboration features, communication, notes posting and quizzes, all of which can be implemented in an online environment.

There are various VLEs of a commercial educational context, which are more widely known and utilised than others, such as, Blackboard, FirstClass, TopClass and WebCT and CoMentor. Each of these has been adopted in an attempt to enable and further provide learning through an online medium (JISC, 2009).

It is noteworthy to state that, in the UK, a publication was recently released, authored by Browne *et al*. (2006), which highlights that the most widely implemented VLE in higher education is Blackboard, with 43.2% of all VLE-adopting institutions favouring this tool. Second was WebCT, with a 34.1% adoption. Another piece of research, focused on a sample of universities in Australia and showed that the most commonly utilised VLE in the country is WebCT, followed by Blackboard and then other in-house programmes.

Before reviewing the research studies associated with VLE systems there is a need to identify its users who will benefit from the technology in order to recognise the best target for the participants of this research. This will facilitate the investigation into their perceptions towards use. This can be achieved by highlighting the characteristics of VLE and the benefits derived by implementing this kind of technology in higher education. The next section describes how VLE can demonstrate its functionality for each type of user.

2.3 VLEUSERS

When establishing users of VLEs, there are three predominant categories: administrators, students and teachers. All of these users are supported through various learning tools, which are provided during each of the course subsections. Each unit provides students with various tools for use throughout the learning process, including resources, materials, communicative tools, assessments and self-evaluation processes. On the other hand, a unit aimed towards teachers may provide the ability to create and upload any course materials and resources, which may be accessed by the learner. In addition, a unit aimed at a teacher may also include the ability to observe student progress and involvement throughout the VLE course. Finally, modules for administrators provide the ability to control access and overall security in relation to the VLE (JISC, 2009).

The above but brief description of target users of VLE delineated three kinds of user and focused mainly on students that administrators and decisions makers want to support. VLE, therefore, should be beneficial to students (Browne *et al.*, 2006). It is possible to enhance, integrate and develop the infrastructure of VLEs; however, important issues may need to complement the process of VLE installation and implementation. These issues are the factors that influence users to accept to use the technology.

In his research on VLEs, Vrielink (2007) stated that despite the fact that online learning has become a hugely popular channel for the delivery of educational objectives; the individual's apparent influences in terms of learning in a VLE are not yet fully understood. The overall effectiveness of online learning is yet to be fully evaluated. Various scholars in the field acknowledge this, namely, Poelmans *et al*. 2009; Van Raaij *et al*. 2008; Doyle*et al*. 2010; Phipps& Merisot is 1999. It is paramount that more in-depth understanding and knowledge is acquired concerning the adoption of online education in an attempt to develop and expand learning for students.

2.4 VLEIN RELATION TO HIGHER EDUCATION DEVELOPMENT

Developments in Information Computer Technology (ICT) and the internet have caused educationalists to acknowledge and understand the advantages associated with technology in relation to learning, thereby enabling a more adaptable and less rigid approach. Szeto (2000), for example, notes that with the advent of technological development, educational models in the 21stcentury are now commonly implementing global frameworks and facilitating educational programmes in networked, technology-orientated environments. Subsequently, the changes witnessed in terms of student requirements in combination with the necessity for long-term education have meant course instructors have begun to consider the concept of Virtual Learning Environment (VLE) teaching in order to accommodate not only students but also teachers in order that colleges are able to survive (Kluge & Riley, 2008). Accordingly, a great number of course teachers are now considering the internet in the delivery of their lessons, utilising the flexibility and ease of access provided by such means. Subsequently, a growing number of educators are now implementing the worldwide web as a complement to traditional teaching methods (Basioudis & DeLange, 2009).

With the abovementioned, it has become clear that more conventional teaching approaches have begun to adapt and change by implementing a number of different online resources, which has seen traditional face-to-face teaching in classroom environments facilitate VLEs. It is further predicted that it will not be long before a vast number of higher educational institutions begin to offer online programmes. For instance, it is stated by the Sloan Consortium (Report 2010) that, during 2009, a massive 5.6 million students enrolled in some form of online educational programme, which is an increase of a million on the previous year, when more than 2,500 colleges and universities nationwide were surveyed. At this present time, a number of well-known universities provide students with the ability to earn high qualifications online with more than two-thirds of higher education institutions offering online courses during 2002–2006 (TeliaSonera, 2009, p. 3).

VLEs mean that education is no longer restricted in terms of location, i.e. classroom environments and times. In fact, with the implementation of this new approach, students will now be able to continue with their education at whatever time or location is most suited to themselves (Allen & Seaman, 2005; Bell & Heinze, 2004). Moreover, academic resources, such as, course materials, literature audio and video files can be accessed via the internet through VLEs, which can then be uploaded by the course instructor as a facility provided by the VLE, thereby providing students with media-rich learning.

When implementing a VLE, there are a number of useful tools available, which can still reap the advantages of traditional classrooms. For example, discussions and teacher-to-student interaction can still be maintained with the use of forums, video conferencing tools or online chats. This is one of the main tools that offer advantages over face-to-face communication (Bell and Zaitseva, 2005). With this in mind, JISC (2009) states that using VLE can provide benefits for learners and teachers by increasing retention levels, decreasing failure rates and increasing performance. When students are experienced with using VLE, they are able to interact more vigorously in system activities and become further involved with the system see Lee *et al* (2001).

Robertson & Shannon (2009) report that there are a number of benefits associated with VLEs, including collaborative work, increased student number capacity, less administration requirements, resource sharing, student-centred learning, and time and place flexibility. Accordingly, it is stated that a VLE is able to provide the benefits associated with both traditional and virtual learning environments. It is, however, important to highlight the fundamental issues requiring attention when conducting an educational course irrespective of whether the programme is to be implemented via a traditional classroom setting or a VLE. In this regard, such factors may relate to flexibility, the availability of and access to technologies, quality assurance, and ease of use, usefulness, and interactivity. In order for a course to be successful, focus must be directed to each of these factors, as earlier emphasised by a number of scholars (Adelman, 1999; Gladieux& Swail, 1999; Turoff, 2000).

Significantly, it has been previously highlighted by researchers, such as, Saettler (1990) and Hill (1997)that developments in this field are best utilised as a complement to standardised practices and not as a replacement. It is considered that this provides additional benefits without incurring any disadvantages. Moreover, owing to the various investments required by the adoption of online courses and, in most cases, where the technical infrastructure is already in place it is reported that it is important to acknowledge and comprehend the various restrictions and possible disadvantages intrinsic when utilising the internet for teaching purposes (Bertolo, 2008). One of these disadvantages that may be recognised by researchers is the complexity of using discussion forums among students or between students and instructors. A study by Bell and Zaitseva (2005) found limitations in the use of communications in the context of education, especially for non-native speakers. With this in mind, it is believed that online learning and its overall character needs to be fully understood, as this will subsequently change the approaches adopted by teachers and students in relation to VLEs.

With the argument above taken into account, this research considers those factors which have an impact on students' utilisation of virtual learning environments in the context of university campuses. More specifically, this research aims to achieve a more in-depth understanding and for the acceptance of VLEs in the perception of students and how various factors may influence subsequent developments in the field of VLE implementation. In order to carry out this research in the context of the study, it is important to provide a brief description of the technology use in Libyan higher education coupled with the use of figures for empirical data.

2.5 HIGHER EDUCATION IN LIBYA

It is relevant, at this point, to introduce the country where the present research is undertaken and the VLE that has been implemented and adopted by Higher Education. Numerous organisations in developing countries recognised the vital benefits of adopting technology use in order to enhance the efficiency and performance for all national sectors. As it has been previously highlighted by Straub *et al*. (2001), those countries have started to assign budgets to finance the installation of infrastructures so as to facilitate the access of reliable information. Although this opportunity is facilitated via budgets and developing countries are keen to adopt the new technology at all levels, the process of the adoption is nevertheless slow compared to developed countries (Twati, 2008).

The difference between these countries in the use of technology may be related to the high costs of building infrastructure and subsequent implementation. Libya, for example, is a developing country still suffering from a variety of barriers, which together prevent the adoption of technology in various parts of the organisation of the country. Notably, however, the government recently made plans to rebuild infrastructure and support organisations by encouraging them to use advanced technology, specifically the education sector (Education Libya, 2007).

There are very limited studies [1] in the area of technology adoption, with this in mind, it is recognised that technology use in Libya is, at present, still in its infancy and,

[1]It is important to indicate that due to the current war in Libya, it is difficult for the study to assess the existing educational system in the country because of lack of access to information and resources of higher education stem.

therefore, minimal, despite Libya being one of the wealthiest countries in Africa. It is ranked 19th out of all petroleum-producing countries in 2004 (ArabNet, 2007). Notably, Libya has transformed itself from a poor to a rich nation after oil was discovered in 1959. Accordingly, the Libyan economy is almost entirely dependent on oil-production, which makes up nearly all of its export earnings and approximately 26% of its GDP (CIA Report, 2007). This has given the government the opportunity to develop its human resources by means of a wider and more developed education system. This has enabled the education ministry to enhance the media infrastructure for the development of schools, where information and communication technology are widely used to deliver information and knowledge to students. One of the initiatives is the adoption of new technology by higher education to improve and enhance education, particularly in universities. This implementation of new technology is still questioned by some experts in the education authority for the practice of this experience.

The aim of this adoption from an administrator’s point of view is to enhance traditional courses and also attract older people who cannot attend classes in person, thus giving them the opportunity to take degrees through VLE tools (Inglis, Ling & Joosten, 2002). Second is the attempt to reduce the huge enrolment numbers on campus, since this has increased dramatically during recent decades. Additionally, as the government finances the higher education system and each university manages its own budget, such rises in enrolment figures will affect the budget. From the early 1980s through to the present, the number of registered students has increased rapidly, therefore causing greater financial demands. Table 2.1 shows the number of students enrolled during the period 1990–2000, which highlights the huge increase in the number of students from approximately 13,000 to 269,000 over this period. This increase continued and by

2006/07, the number reached 285,000 students. Note that, the researcher obtained details of the numbers of students enrolled during the academic year 06/07 from the Secretariat of Education via e-mail owing to a lack of published resources.

Table 2-1 student enrolment 1990-2007

Source: http://www.bc.edu/bc_org/avp/soe/cihe/inhea/profiles/Libya.htm(edited by Swesi, 2008)

Year	No. of Students	No. of Students in Higher	Total
1989–90	50,475	3,916	54,391
1992–93	101,093	12,921	114,014
1993–94	116,473	16,912	133,385
1995–96	160,000	28,106	188,106
1996–97	160,112	54,080	214,192
1997–98	168,123	58,512	226,635
1998–99	165,447	58,877	224,324
1999–00	204,332	64,970	269,302
2006–07	214,250	71,200	285,450

Table (2.2) shows the public universities in the country and the number of students enrolled in each for the year 2003 (El-Hawat, 2003).

Table 2-2Libyan Public Universities

Secretary of education (2008) E-mail from the education secretary

University	Established	Location	Enrolment
Al-Fateh Univ.	1957		75,000
Gar-yunis Univ.	1955	Benghazi	45,000
Seventh of April Univ.	1988	Az-zawyah	26,000
Omar El Mukhtar Univ.	1989	El-bida	12,000
Sebha Univ.	1983	Sebhah	9,000
Nasir (foreign students) Univ.	2001	Tarhuna	400
Mergeb (four campuses) Univ.	1988	Khoms	18,000
Tahhadi Univ.	1988	Sirte	8,500
Graduate Studies Academy	1998		2,600
Al-jabal Algharbi Univ.	2001	Jabal Al-gharbi	9,500

As has been mentioned earlier in this section, technology remains a new phenomenon. In spite of this, however, it is worth pointing out that there are a significant number of internet users amongst the general population, many of whom use local internet cafés. This number increased from about 20,000 users in the year 2000 to over 345,000 in 2009 (Internetworldstat, 2009), which is evidence of a growth in internet usage amongst the general population in Libya. In this regard, there is no definite knowledge of the attitude of students in Libya towards the use of the internet owing to the absence of studies surrounding internet usage in Libyan universities or other studies, which may have given an idea of the general attitude toward the adoption of new technology.

Recently, money has been allocated (by the government) for the purpose of establishing better internet usage in the major universities of Tripoli and Benghazi (Education Libya, 2007). The intended improvements include the provision of databases common to these universities (with the intention of extending to the others at a later date), setting up VLEs to create a new environment conducive to learning and thus enabling improved interaction between students and tutors.

The perception of Libyan students towards new technology usage, including their learning style preferences should be surveyed so as to obtain an accurate picture, which could then form the basis for the development of improved e-learning tools, web-based education and complete online education courses that would be acceptable to Libyan students and academics in higher education.

The researcher decided to select Libyan university students as participants in this study for various reasons. First, due to VLEs having only recently been installed, this type of technology is still at the pilot stage in one of the main and biggest universities. The system may, therefore, be met by public indifference and in some cases rejected because of the lack of experience. Second, internet provision in secondary schools is poor. Students come from different disciplines, including those from non-technical backgrounds, such as religion, psychology and humanities, which do not primarily depend on the use of technology. Therefore, the non-experience of these students may lead them to ignore or reject the use of such new technology. Third, numerous previous studies have reported the close gap between gender differences related to the use of technology Sherman *et al*. (2000) Sanders &Morrison (2001). The researcher, therefore, is keen to investigate the differences between the genders. Such an investigation is significant as the number of females enrolled in higher education has begun to equal males. Fourth, owing to a further 15 universities opening at different geographical locations in the region, the results of this research and the impact of the utilisation of technology, i.e. the installation VLE, will assist other universities to invest in such technologies.

Libyan secondary schools are equivalent to years 9, 10 and 11 when compared to the UK's system. The secondary education system in Libya is an extension of their intermediate schools with the students segregated by gender as in earlier years. Students receive 27 hours of teaching a week. The curriculum includes Arabic, Koranic studies and Islamic morals, Libyan society, English, Mathematics, History, Geography, Biology, Chemistry, Physics, Principles of Technology, Art, Music and Physical Education. Importantly, this is referred to as preparatory education and a student can receive a secondary education certificate if he/she wants to leave after this stage (Secretariat of Education, 1970). Secondary school education is divided into two types of specialisation: Literary and Scientific. The literary students will learn socialism, history, Arabic, etc., none of which are related to science and technology. This leads to there being no opportunity to use new technology.. Thus, the specialisation factor is very important to consider and to investigate throughout this study.

2.6 VLERESEARCH

Despite there being a vast amount of literature relating to various important areas of education, i.e. learning, teaching and general teaching methods, there is nevertheless a void in the literature about how VLEs, for example, may be utilised to their greatest potential in order to better facilitate learning and provide additional advantages for both learners and teachers (Housego & Sydney, 2000). Few researches have explored and investigated the acceptance and usage of VLEs (Vrielink, 2008; Poelmans *et al*. 2008; Milis *et al*. 2008; Van Raaij *et al*. 2008). In an educational context, it can be seen that the majority of the literature makes reference to the utilisation of the internet for learning but does not expand further than this. Furthermore, research carried out by Vrielink (2008) who investigated pupils' acceptance of VLEs showed that online teaching tools are utilised minimally. A large portion of students did not understand how the tools can be effectively adopted, although nevertheless acknowledging the advantages of doing so.

Moreover, comparable findings were highlighted by an early study of Jiang & Ting (1998).They considered the individual factors impacting on the way in which students perceive online educational tools and subsequently reported that interactive environments facilitate improved learning. In addition, Taley-Ongan & Gosper (2000) gathered feedback from students about their experiences of interaction in the context of online education and found that over a two-year period students were found to have improved their skills and understanding of online learning. For instance, it has been observed that there has been an improvement in the overall fulfilment experienced by students in relation to a number of vital online-education areas, namely, online tutorials, peer-to-peer interaction, overall satisfaction and they wanted to continue to learn further units via the internet. It has been further determined that, with the adoption of more accommodating options, fulfilment and general satisfaction will increase. It is also worthwhile to note that increased ratings of adoption could also be due to a heightened conviction due to using the tool.

Furthermore, an additional aspect of VLE being researched has been concerned with establishing both the performance and subsequent achievements experienced by students involvement in online courses in comparison to those undertaking courses in a traditional classroom environment (de Lafuente Duff, 2008; McPhee *et al*., 2010; Loomis, 2000). No definite conclusions have been formed in this area with literature showing mixed results. Numerous researches seem to signify that there is little significant difference between online and classroom environment studies (Hall, 2001). In contrast, a study was conducted by Joanne *et al*. (2005) to investigate the differences between academic staff using VLE. The study used face-to-face interviews to fill a designed questionnaire by 62 members of staff in order to assess the use of VLEs in Leicester University. The research identified two types of users: Blackboard users who adopt VLE and create materials for modules and Blackboard non-users who use a VLE without contributing materials or who have never used the system. The results further revealed that the majority of the participants fail to use the system, although the system has full functionality. One possible reason is a limited number of staff attended formal development and training sessions. Some believed that simply putting materials on the web does not enhance student learning, as stated by Lingard (2007). Currently, students or staff may view the technology, especially VLEs, as sophisticated and complex and may prefer traditional methods. Furthermore, Wegner *et al*. (1999) carried out a study using a control group (n=17) whose members received traditional education while an experimental group (n=14) were engaged in online education. Both groups were observed for two semesters. It was found that there were no significant differences between the achievement and performance of the two groups. Assessment and test results both showed generally the same progress. Nevertheless, it was found that those students in the second (experimental) group had more positive attitudes and were generally more satisfied with the course.

Campbell et al (2008) said, “Rather than being disadvantaged, participants in online discussions obtained higher marks generally in their assignments than those taking face-to-face seminars, suggesting that the online route was associated with higher

achievement.” This finding was supported by the outcomes of Patzold (2005) who establish that the more involved learners are with online content through the use of WebCT, the better their examination scores. In addition, Hepworth and Walton (2009) reported that those students who engaged with online collaborative learning environments via Blackboard shown greater critical thinking compared to students in face-to-face sessions. APLU (2009) reports that majority of staff members involved with online teaching believe that student-learning outcomes are superior compared to face-to-face methods. The majority have recommended moving towards online courses.
In 1999, Sandercock & Shaw carried out research, which reported that despite there being no notable contrasts in terms of academic performance between the control and experimental groups, it was nevertheless established that there had been improvements in computer use and technology-related skills for those students enrolled in online courses. Although it appears that there are no significant differences between the progresses of students in either traditional or online educational groups, some research does highlight various improvements where students have been taught via the internet. One such example is the research of Schutte (1996) who carried out a study on a sample of 33 students. The learners were divided into two groups, i.e. 17 in a traditional setting and 16 in an online class. The results showed that those students being taught online scored up to 20% higher than those students in a traditional setting. Importantly, however, it seems that online classes suffer from high drop-out rates, which seems to be a widespread problem with such education implementation.

It has been established by Carr (2000) that there are two fundamental factors that influence drop-out rates in the case of online courses: firstly, student attitude and secondly, the overall capability to determine main ideas. Notably, those learners who do not seem to acknowledge the overall process associated with further learning and qualification attainment may be at a higher risk of, firstly, failing to work on coursework and other graded pieces and secondly to drop-out. Furthermore, it is also believed that those students who are not able to decipher between valuable and non-valuable information may also be unsuccessful in terms of completing the overall learning experience.

It is stated by Russell (1997) that an additional influencing factor in terms of online learning is the media that is utilised to facilitate education in such a context. Russell states that it is often considered that new, more advanced technology should facilitate better learning outcomes but that this is often not the case. Furthermore, there is a mixture of views held in terms of VLEs with some people believing that the quality associated with the teaching, learning and overall interaction in an online environment exceeds that of a traditional one, whilst others view the lack of face-to-face contact between the teacher and learner as being detrimental (Smith & Stephens, 2010). Nevertheless, it is further stated by Sorensen & Takle (2002) that VLEs are not rigid and may, therefore, adopt one of many different styles to better facilitate interaction between students and teachers. It remains, however, that there is currently a lack of models concerned with ensuring the development of collaborative knowledge and there are also issues concerning establishing the value of data and ensuring communication. With this taken into account, it may, therefore, be stated that irrespective of the medium utilised, it is fundamental that a learning environment is provided, which enables both the teacher and the student to ensure communication and interaction both with peers and also with the course materials (Liu *et al*., 2009).

With regards to research in the area of acceptance of VLE, which is the focus of this study, few studies have been conducted in relation to the acceptance of VLE and the factors that can influence users to accept the system. With this in mind, IS scholars are still striving to develop theoretical models that can help to explore its usage. For example, Vrielink (2008) conducted an empirical study on students' acceptance of web-based education. The study investigated the factors that contributed to the use of learning and teaching tools. The results show that students were satisfied with the use of the blackboard and the majority accepted them as learning and teaching tools. Another group preferred the use of a weblog as a teaching tool. He reported that various important factors, such as, enjoyment and usefulness play a vital role in acceptance and actual use. Another study was conducted by Floyd (2010), utilising Chang& Tung's (2008) modified technology acceptance model to compare e-learning and traditional teaching of modules. The study adopted a questionnaire and an interview to collect the results, which indicated that some students were positive about e- learning usage but others were unwilling to use the technology owing to the absence of many aspects of VLE. He concluded that, after the comparison, VLE might be able to enhance student learning compared with more traditional methods. This indicates that new technology used in education becomes an important tool that enhances the education process. This factor is considered by the university's decision-makers in the Tripoli University as a reason to install and invest in VLE implementation.

According to Poelmans *et al*. (2008) results, the majority of students accept the use of VLEs. They included system and information quality as an independent factor that influenced their belief constructs of the TAM model. Notably, the factor information quality has a significant impact in terms of perceived usefulness as well as the system quality, leads to a positive effect on the perceived ease of use. They concluded that the attractiveness of the user interface, the attendance of suitable search option and the availability of sufficient information are critical achievement factors in VLE acceptance. Moreover, the acceptance and usage of VLE in higher education has been investigated by a study conducted by Keller (2009). The study applied a qualitative method for gathering data to explore VLE implementation using two IS theories, namely, Innovation Diffusion Theory (IDT) by Rogers (1995) and Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh *et al*. (2003). Performance effort expectancies, social influence and facilitating conditions were found to be independent factors. Gender, age experience, and voluntariness of use were the moderating factors between independent and intention to use as a dependent variable. The findings reveal that there was a great deal of evidence regarding high-degree performance expectancy, which seems to improve the implementation process of VLE. Amongst the factors were social factors, which have been found to have a positive impact on the usage of the system, as found by previous studies (Lewis *et al*. 2003; Venkatesh & Davis, 2000; Igbaria *et al*., 1997; Davis, 1989; Davis *et al*. 1989; Anandarajan *et al*., 2000). In addition, based on empirical findings, it was also concluded that the level of VLE acceptance in an educational context depends on cultural organisation. The study reports that the two main factors potentially preventing the implementation process are academic freedom and organisational culture, which highlights that learning on campus, is considered to be a perfect approach. From the methodological perspective, the evidence that the qualitative method is another option to employ in the adoption and acceptance field, the author was able to collect data from three European universities.

Another study by Milis *et al*. (2008) has been conducted to explore factors, such as, being socially constructive, which have received attention from previous studies and which are recognised as influencing the acceptance of VLE. Milis *et al.* linked the acceptance of VLE to gender and learning attitudes. They also included two factors in the TAM model, namely, system quality and information quality, as independent variables to explore the difference between gender groups. The study established that a digital gap was apparent between males and females, which led to lower levels of acceptance by female students. They revealed that gender plays an important role and is indubitable based on empirical evidence but when using traditional data analysis it is difficult to discover its relationship to technology. They concluded that female students felt that they lack confidence when using the system because they consider it too sophisticated.

Furthermore, Neuforn (2007) carried out research exploring the gender gap with respect to the perception of VLE. He used the IS TAM model with the gender as an independent factor in order to investigate how females and males deal with text-based communication with regard to the absence of all verbal means of communication when using a virtual learning environment. The researcher holds the opinion that users' creations and perceptions of text-based communication may be a cause of decreasing the level of participation in VLE use. The findings reveal that females are less inclined to use written messages that males. He further reported that females need some sort of support when using VLEs in order to increase online interactions. Furthermore, in terms of the gender issue with its relationship for the adoption of E-learning, Hsbollah and Idris (2009) conducted a study that included gender and academic specialisation in their research model based on Rogers' (1985) adoption theory. They found that only academic specialisation, relative advantages and trial ability were significant. Similarly, studies have been conducted using various IS theories and models to investigate the level of acceptance of VLE. Table (2.3) lists some of the most recent studies, which have been carried out so as to discuss the various issues and factors that may help to gain an understanding of the acceptance and usage of VLE.

Table 2-3VLE acceptance research

Author and Year	IS model	Factors
Keller, 2009	IDT, UTAUT	Contextual factor of culture, performance expectancy, organisational culture
Vrielink, 2007	TAM	Enjoyment, age, gender
Vrielink, 2008	TAM	Enjoyment
Poelmans *et al*., 2008	TAM	Information quality, system quality
Floyed, 2008	TAM	Social constructive
Chang & Tung, 2008	TAM	Compatibility, system quality, self-efficacy
Milis *et al*. 2008	TAM	System quality, information Quality, connected knowing, satisfaction, Gender
Lingard, 2007	Innovation diffusion IDT	Rogers' factors (qualitative)
Van Raaji & Schepers, 2008	TAM2	Subjective norm, personal innovativeness in the domain of information technology, and computer anxiety
Van Schaik, 2009	UTAUT	Prescribed websites and user-selected sites, intrinsic motivation, performance expectancy, mediated by effort expectancy
Sumak *et al*. 2010	UTAUT	Performance expectancy, social influence
Doyle & Short, 2010	UTAUT	Rogers's factors

The success of implementing VLE is based to a considerable extent on students' acceptance and effective use of this enhanced online leaning. A study carried out by Van Raaij and Schepers (2008) attempted to explain the differences between students as to their level acceptance and use of VLE. The study assessed the adoption theories TAM, TAM2, the Unified Theory of Acceptance and Usage of Technology (UTAUT) and has targeted TAM2 as an extended conceptual research model. This model is comprised of various factors, such as, subjective norms, computer anxiety, and personal innovativeness. The study revealed that perceived usefulness has a positive direct impact on VLE and is the main factor that influences the intention to use. They reported that a subjective norm positively affects the intention to use but indirectly through usefulness. Anxiety only affects perceived ease of use. The study showed that Chinese culture is affected by social factors and they play a major role in the process of adoption and acceptance of technology.

Recent studies into online learning have investigated factors that play a role in the acceptance of VLE. These factors are technical support and encouragement (Martins & Kellermanns, 2004), system quality (Pituch & Lee, 2006), self-efficacy (Ong et al., 2004), experience of using VLE (Doyle & Short, 2010) and other various factors that influenced beliefs constructs that pertain to the TAM model, such as, system characteristics, the availability of support and social context conducted (Sun & Zhang, 2006). Most of the studies revealed that these factors had a significant impact on the process of acceptance and adoption of VLE.

It is clear through the various reports and literature that is available that either research on use, comparisons, integration and development or on adopting and accepting VLE (as was described earlier), although being useful and providing a wealth of knowledge there is nevertheless a void in terms of an individual preference learning styles factor. This factor may play a significant role in influencing VLE users. This has stimulated the researcher’s own interest concerning these factors so as to include learning styles as the main variable that may play an important role together with other factors believed to impact on VLE users in different contexts, particularly in developing countries, such as, Libya, which considers this technology new and is inexperienced with it. The researcher believes these factors will contribute to the IS research body of knowledge.

With regard to research in the area of learning styles and its relationship to online learning, particularly VLE most previous studies do not focus on the acceptance of VLE and the impact of learning styles. They focus, rather, on aspects of online learning, such as, integrating, modifying and developing course content (Huang, 2003; Bechter and Esichaikul, 2008; Lu *et al.*, 2007; Naser-Nick, 2009; Richmond and Cummings, 2005). For instance, a study carried out by Lu *et al.* (2007) measured the relationship between Kolb learning styles, learning outcomes and the relationship between the outcomes and the enduring times of various online behaviour. This research was conducted in order to understand the importance of learning styles on various aspects of online learning so that modules could be customised with respect to different students. The findings revealed that Kolb’s model of learning styles had a significant effect upon the total reading times and the time of discussions that students take. The results, however, show that no relationship was found between learning styles and the learning outcomes. In the meantime, Lu *et al.* reported that convergers and assimilators score higher than divergers and accommodators in relations to learning outcomes. The study warns instructors to consider the diversity of learning styles when proposing and planning online leaning modules for different users.

In the same vein, Leigle and Janicki (2006) showed that adapting or modifying online modules to the various learning styles should increase learning outcomes. In a study conducted by Simpson and Du (2004) who investigated the relationships of learning styles and self-reported enjoyment found a relationship between learning styles and the online course. They reported that participants with converging styles experienced feelings of higher of enjoyment compared to divergers, accommodators and assimilators respectively. They stressed the need to consider learning styles when designing web-course learning and recommend using Kolb LSI for this purpose. Similarly, Richmond and Cummings (2005) reported that learning styles should be considered when designing distance learning. This is because of the significant relationship between these two factors that research in this field has revealed. With this in mind, they suggest adopting Kolb's learning styles theory because of its promise to provide a concrete framework for achieving this aim.

Bechter and Esichaikul (2008) conducted a study using Kolb learning styles inventory to investigate the relationship between learning styles and the personalisation effect of e learning. The outcome revealed that there are differences between learning styles and discussion boards, communication tool use and problem solving setting. Accommodators and divergers score highly with respect to interaction with online discussion while assimilators and convergers prefer to contribute more by adding content. In terms of communication between peers, assimilators, for example, prefer using discussion boards while accommodators prefer to use e-mail to communicate with their peers or instructors. The latter stated that communication via discussion boards is complex due to their lack of experience. The study concluded that it might prove difficult to match an e-learning approach to each learning style. It is worth noting that many researchers have found the tool for communication between students, peers or student to instructors remain obstacles and need to be researched (Huang, 2003; Fahy, 2005). In terms of complexity of using communication and exchange information, see Bell and Zaitseva (2005).

It was highlighted by Graf *et al.*, “Adaptively aspects based on cognitive traits and learning styles enrich each other, enabling systems to provide learners with courses, which fit their needs more accurately”(2009, p.1280).In their research study they investigated the benefits of incorporating both cognitive traits and learning styles into the context of online learning. The differences of learning styles were found in relation to web-based educational systems. They stressed the desirability to customise and support learners’ needs with adaptive courses and learning experiences and that it is an important issue in the approach to online leaning. They also found a relationship between learning styles and memory. They, therefore, stressed the need to consider learning styles and cognitive traits when adapting courses to suit learners’ needs.

Another empirical study was conducted to investigate the influence of learning styles on learners in the e learning setting. Naser-Nick (2008) used Kolb’s inventory to determine the effective use of e learning for students who have a particular learning style. The results of his research revealed that the learning styles of students who were involved in tradition class (instructor- based learning) are not significant, while for web-based students the learning styles is significant and very important. The researcher found that assimilator type students learn more via lectures, papers and analogies, while convergers learn through fieldwork and observation, and accommodators like simulations and case studies. Naser-Nick concluded that learning styles were statistically significant and there are differences between students preferred styles and their knowledge performance. In addition, the study found that students who were involved with e learning progressed better than those that followed the traditional method.

As has indicated earlier, a number of previous studies have been conducted to investigate the relationship between learning styles and the online learning environment. These studies aim to understand the role of students’ preferred styles of learning in order to customise, integrate, and design modules or modify course content and to integrate diverse modes of communication to suit students’ needs (Richmond & Cummings, 2005; Thiele, 2003; Henke, 2001; Onga et al., 2004; Kastner & Stangl, 2011).

As the present research’s focus is directed on the perception and use of technology, it is important to consider this subject in order to assist the development of the research model, which is described in Chapter Five. Accordingly, the next section will present the perceptions and use of VLE.

2.6.1 USAGE AND PERCEPTION OF VLE

An increasing number of teachers are now acknowledging the advantages associated with carrying out educational classes via an online medium and so more and more researchers are now focusing on the individual factors believed to be impacting upon the use of VLEs. As previously mentioned in chapter one in connection with IS studies, the two major factors believed to influence VLE use and user acceptance are perceived usefulness and perceived ease of use (David, 1986; 1989).

Ong *et al*. (2004) carried out a research with a sample of 140 engineers from six different international organisations. The study examined the various different factors believed to have an impact on the engineers’ overall attitude and acceptance of the conception of e-learning. The most important factor established through the research was that of perceived usefulness, followed by perceived ease of use and perceived credibility.

Moreover, Ngai *et al*. (2007) conducted an empirical research, which sought to determine the overall implementation and the use of the tool WebCT. The study took a sample of 836 university students and subsequently determined the perspectives of the sample towards the tool. In addition, Lederer *et al*. (2000) conducted research, which sought to determine the utilisation of websites for work-relevant duties. The study surveyed a sample of 163 individuals and subsequently determined that web usage was significantly affected as a result of ease of use and usefulness; nevertheless, it has been established that usefulness is more influential than ease of use. Similarly, Devaraj *et al.* (2008) surveyed 180 participants and found that ease of use has a significant impact on usefulness and attitude to use a collaborative system and usefulness is a useful predictor of attitude to use.

In further research carried out by Teo *et al*. (1999), a sample of 1,370 individuals was surveyed via the internet. The study determined that the sample used the internet owing to the fact that they considered it to be useful when carrying out tasks. The results show that perceived usefulness is approximately three times more influential than perceived ease of use. Similar findings were also found by the study conducted by Karahnna & Straub (1999).They took a sample of 100 email system users and found that the only significant factor that related to email use was perceived usefulness. Importantly, despite being relevant in other studies, perceived ease of use was found to have no impact in relation to email use but it was established as having an incidental effect in relation to perceived usefulness. This was consistent with the findings of Vrilink's

(2008) study that perceived usefulness directly affects intention to use VLE. Seyal *et al.*, (2002) found perceived usefulness indirectly affected the intention to use and the impacted only via attitude. It has been reported that VLE perceived by students as being useful, effectively interacted with their learning. A study by Yu *et al*. (2005) established perceived usefulness as being the best predictor of intention to use VLE, both directly and via attitude. Furthermore, Sumak *et al*. (2010) found that the most determinant of intention was perceived usefulness.

With these many researches taken into account, it would be accurate to state that perceived usefulness and usage seem to have a more influential and direct effect than ease of use and usage. Importantly, this statement seems to be a reflection of the conclusions drawn in other relevant IS literature, such as, Davis (1989), Mathieson (1991), Adam *et al*. (1992), Davis (1993), Keil *et al*. (1995), Hendrickson & Collins (1996), Gefen & Keil (1998), Karahanna & Straub (1999), Lou *et al*. (2000), Yang &Choi (2001), Ma & Liu (2004),Lai & Honglei (2005),Sahin & Shelly (2008),AL-Gahtani (2008),Wang & Wang (2008), Chatzoglou *et al*. (2009),which has established that there is no correlation between frequency of use and perceived ease of use. Therefore, it may be stated that the implementation of a software application is linked fundamentally to its associated simplicity or complexity in functioning (David, 1989). Users, however, may still be inclined to implement a specific application that is difficult to use if it is considered to provide an important function but not if the results are not linked with the ease of use; in other words, if the outcome is highly desirable, a greater degree of complexity may be accepted. Nevertheless, it should be emphasised that such a conclusion is contradicted by other research, such as, that of Swesi (2008), which stated that users are usually unwilling to utilise IS, even if it is known to provide important advantages.

For instance, a study was conducted by Seyal & Pijpers (2004), which examined the use of the internet by 100 different senior government executives from the 10 different ministries of Brunei Darussalam. The study established that internet usage could be estimated by considering the factor of perceived ease of use as opposed to perceived usefulness. Moreover, a similar study carried out by Shih (2004a), which sought to assess user willingness to shop over the internet, utilised information gathered from of 212 questionnaires. The results subsequently highlighted that users' willingness to shop over the internet was significantly affected by perceived ease of use. In contrast, however, perceived usefulness (of the website in question) was found to have no direct or significant correlation with users' willingness to shop online. In order for usefulness to have a direct effect on VLE use compared with effectiveness, a study carried out by Van Raaij & Schepers (2008) found that perceived usefulness has more influence than ease of use on the acceptance of VLE in China. Similarly, a study conducted by Vrielink (2008) highlights the important role of perceived usefulness in positively influencing the decision to use new technology and its subsequent actual use.

As is clear from the abovementioned researches, there is divergence between the findings, which could be owing to the fact that IS utilisation was complementary. It is considered that IS, which provides simplistic ease of use will be more widely implemented by users; the opposite can be stated for IS, which may be considered problematic in terms of utilisation. Furthermore, it is also believed that another potential factor relevant to the lack of consistency in the findings may be due to a poor focus when researching IS acceptance (Dishaw & Strong, 1999; Page, 2003). As determined so far, there is a lack of consensus surrounding users' perceptions and actual utilisation in regard to web-related applications. This research, therefore, seeks to determine the influential factors known to be affecting student perceptions in relation to various factors, i.e. perceived usefulness, perceived ease of use, etc. in an attempt to determine the cause for the lack of inconsistency witnessed in previous research.

2.7 IS ACCEPTANCE MEASUREMENTS

Recent IS-related studies have focused upon user acceptance (Al-Gahtani, 2008). As highlighted by Davis (1993), the success of IS has been fundamentally hindered owing to a lack of user acceptance. Importantly, irrespective of the practical advantages, any organisation that implements an IS that has previously failed to achieve user acceptance is essentially worthless. Furthermore, such a lack of user acceptance and subsequent IS failure has meant that various organisations have been unsuccessful in achieving the advantages associated with IS as stipulated by those who created the software (McFarland & Hamilton, 2006). Accordingly, it is considered that user acceptance is vital when seeking to achieve success in terms of information system projects (Swanson, 1988; Davis *et al*., 1989; 1993; Igbaria, 1993; Al-Gahtani, 2008; Poelmans *et al.,* 2008). This research seeks to analyse the factors that play a pivotal role that affect users overall acceptance of VLEs since the overall aim of this study is to assess the level of VLE users' acceptance based on users learning styles.

Without question, the recent years have witnessed significant developments in terms of estimating and describing user acceptance of IS. Subsequently, this has resulted in a vast number of researches being carried out, which have considered the various factors responsible for estimating the level of acceptance of IS users (see table 2.3 chapter two) by considering the question, 'Why do users reject or accept IS?' (Davis *et al.,* 1989) It is considered that the anticipated findings of the current study will further assist the various professionals in the field i.e. developers, designers and users to achieve improved user acceptance, thereby resulting in overall system success (Al-Gahtani, 2008).

Thus so far, this research has discussed the literature and past research relevant to the adoption and overall recognition associated with VLEs with a keen focus directed towards the acceptance of VLE by incorporating the role of learning styles as one of the main factors, which potentially influence students in a university environment with the overall aim of providing complementary support and facilities for both the learning and teaching process. As ascertained so far, there is a clear void in terms of the overall capabilities offered by the internet and its general utilisation in terms of facilitating everyday education in terms of both learning and teaching.

The various different points of view assumed in the previous studies were carried out in relation to VLEs. The increasing number of inconsistencies in their findings subsequently highlights the need for a theoretical model so as to gain a deeper insight into the correct adoption of a VLE. Such a framework will enable further the literature gap to be filled and would, therefore, provide scholars and researchers with a further understanding of users' attitudes and a willingness to utilise VLEs in their studies. It is, therefore, considered important that the literature linked to measurements are considered and also any frameworks adopted in an attempt to analyse user acceptance of IT and IS are taken into account in order to steer the research towards developing a theoretical framework. In this regard, to enable this study to measure the perceptions of students towards using VLE, the next chapter details the most important theories and models that have been established to assist in obtaining these measurements. The study then will review the previous well known IS acceptance models that have been validated by numerous studies and have to be proven acceptable.

It should be noted that the terms IS and IT are commonly used interchangeably. The two terms are undoubtedly closely linked but they do have differences. An IS is an assemblage of various different components, i.e. data, hardware, procedures, software, and relevant persons. IT, on the other hand, refers to inventions, methods, products and standards adopted with the aim of creating data. Accordingly, it is considered that the term IS is more relevant in the context of this current research owing to the fact that a VLE may fall under the category of an IS. Despite studies in IS and IT being fundamentally different, the previously noted studies are nevertheless closely linked owing to the fact that IT motivates development in the area of IS.

2.8 CONCLUSION

This chapter has discussed many issues related to the first part of literature review. It started by reviewing the VLE literature and how it has been researched particularly in the IS field. The chapter aims to identify the importance of VLE in education and the research that has been done into its various aspects of use, such as, integrating, developing, comparison and the degree to which VLE is used. Based on these discussions, it found that there is a lack of research related to the acceptance of VLE based on the effectiveness of learning styles. The chapter describes the current issues related to VLE from the usage of point of view and establishes that a gap exists in the literature that will be addressed by this study. The chapter highlighted the importance of gender and experience in using technology in Libya and its impact on accepting the VLE system.

As this research will investigate the impact of factors that may affect the acceptance of VLE use, the chapter details ways to measure this phenomena by indicating the need for such a tool or the creation of a model that may guide the research in order to respond to the research questions presented in chapter one. To achieve this and develop a suitable IS model; the chapter presents the relevant information that is required in the second part of the literature review. Consequently, the next chapter will present the most important IS theoretical models in order to choose a foundation framework that is able to measure the acceptance of VLE and answer the research questions.

3 INFORMATION SYSTEM ADOPTION MODELS

3.1 INTRODUCTION

The chapter aims to continue the previous chapter in order to gain a complete picture of the phenomenon. Thus, it seeks to review the relevant studies of adoption that use technology acceptance and IS theoretical models with the latter focusing upon determining the level of acceptance. The chapter presents the three most influential IS models considered suitable for the purpose of this research, namely, Theory of Reasoned Action (TRA), created by Fishbein & Ajzen (1975), the Theory of Planned Behaviour (TPB), which is a development of TRA provided by Ajzen (1985; 1991) and the Technology Acceptance Model (TAM), as developed by Davis (1986). In addition, the chapter presents the advantages and disadvantages for each of the aforementioned models, as well as their limitations in order to assist to use a suitable theoretical model as a tool to develop the present research model.

3.2 ISTHEORITICAL MODELS

A review of IS literature shows that there are various different frameworks and paradigms, which can be utilised by academics when examining IS acceptance, which is applicable to this research. The theoretical models that were adopted in an attempt to review and analyse IS acceptance amongst users will be reviewed and examined in order to deliver a brief summary about how these frameworks operate. More specifically, attention will be directed not only to the advantages provided by each model but also the limitations of each in order to provide a balanced and accurate overview to develop the research model.

From the literature considered so far, it is clear that a number of theoretical perspectives have resulted from the various frameworks that were implemented to analyse IS acceptance. Essentially, in a technological context, one of the most predominant frameworks is the Theory of Innovation Diffusion (Tornatzky & Klein, 1982; Rogers, 1983; Moore & Benbasat, 1991), which aims to establish technological factors that may have an impact on users who wish to use technology. In this context, Rogers (1995)stated that the term 'innovation' might be taken to mean, "An idea, practice or object that is perceived as new by an individual or another unit of adoption.", Whilst the term 'diffusion' may be defined as, "The process by which an innovation is communicated through certain channels over time among the members of social systems". With this taken into account, users' acceptances of new ideas and their subsequent implementation may come because of innovation diffusion.

It is stated by Tornatzky & Klein (1982) when considering innovative implementation, three fundamental factors have a significant impact on the innovation process: compatibility, complexity and relative advantage. This has been determined by meta-analysis, which considered 75 different articles and examined the relationship between these three factors and innovation adoption. In addition, several other innovative factors have been recognised by Roger (1983): compatibility, complexity, observability, relative advantage and trialability. Research, via a survey, targeted several thousand students with respect to their context relevant innovation. It is subsequently believed that each of above five factors has some degree of impact on the diffusion rate of a specific technology. Moreover, it is maintained by Roger (1995) that these characteristics may explain up to 87% of adoption variance.

Moreover, work conducted by Brancheau & Wetherby (1990) have conversely determined a positive correlation between compatibility and relative advantage when considering the implementation of spread sheet software in a number of different sectors. Hoffer & Alexander (1992) have demonstrated that there is also an important relationship between compatibility and relative advantage with that of database machine distribution. In a similar line of research, Moore & Benbasat (1991) have established, created and developed several factors, all of which are able to analyse how different views and experiences may have an impact on the utilisation of various innovations by individuals. These factors are compatibility: ease of use, image, relative advantage, result demonstrability, trialability, visibility and voluntariness. When considering the contexts of behavioural intention and social psychology of this research, a significant number of different models have been suggested in an attempt to investigate and analyse the factors associated with individual behaviours as to adopting the technological standpoint, which is believed to have an impact on IS utilisation. Such frameworks are founded upon purpose and objective, which notably utilise behavioural intention in order to measure acceptance and to subsequently direct emphasis to establish intentional factors (Taylor & Todd, 1995b). These include the Theory of Reasoned Action (TRA), created by Fishbein & Ajzen (1975), the Theory of Planned Behaviour (TPB), which is a development of TRA provided by Ajzen (1985; 1991), the Technology Acceptance Model (TAM), as developed by Davis (1986) based on TRA and the Decomposed Theory of Planned Behaviour (DTPB) proposed by Taylor & Todd (1995b).

This research concentrates on VLE acceptance from the users’ perspective. One stage in this research involves evaluating how individual learning styles affect attitudes towards the adoption of VLE. The second stage of this research will use a selected intention-based framework, which will be able to answer the research questions described in chapter one. It is considered fundamental that such an intention-based framework be recognised when applied for examining the utilisation of IS and which subsequently may be adopted in an attempt to predict student acceptance of VLEs. It is deemed, therefore, necessary to provide a detailed description of each of these models to ensure understanding why TAM is considered the most suitable one for this research. In the next sections, the study will review the literature on the most commonly used models in the field of technology acceptance. These models are popular and serve as a base for IS literature and relate attitude and behavioural to use.

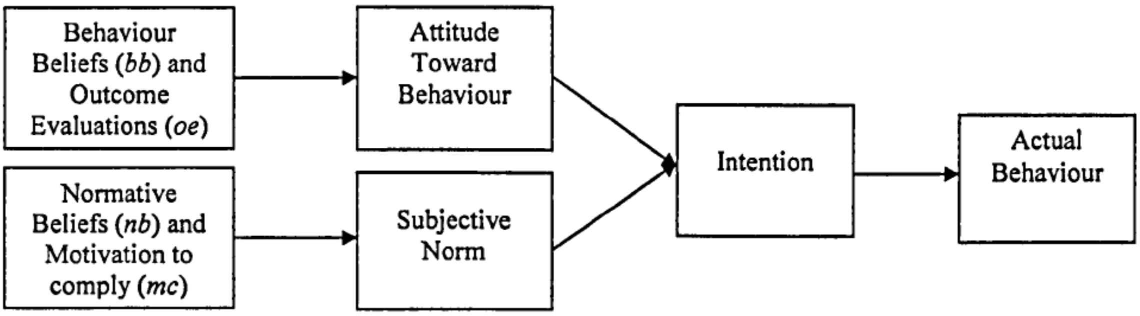
3.2.1 THEORY OF REASONED ACTION (TRA)

The Theory of Reasoned Action (TRA) is a social psychology model, which, since its beginning, has received a great deal of academic attention with its emphasis directed towards the factors associated with purposeful behaviours (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). Importantly, this particular model seeks to describe and determine the behaviours illustrated by individuals through the identification of a number of different factors, including attitude, behaviour, beliefs and intentions.

Figure (3.1) below shows the TRA, which clearly illustrates the central, motivational factors, which are believed to steer behaviour prediction studies from intent. Notably, it may be stated that, generally, behaviour is far more likely to be carried out if the level of intention displayed by the individual is high.

Figure 3-1The Theory of Reasoned Action (TRA)

Source: Davis *et al*. (1989)



The Theory of Reasoned Action was developed with the aim of explaining behaviour based on the assumption that people perform rational and logical actions by intentionally taking into consideration the predicted consequences of such behaviour, as well as the data available to them. With this in mind, Ajzen & Fishbein (1980) proposed that individuals generally consider the consequences attached to certain behaviour before acting on any desire to pursue an action. The researchers accordingly refer to this as a Theory of Reasoned Action.

As can be seen from the figure above, the TRA identifies two theoretical and independent factors in order to determine the intention: attitude towards behaviour, which is a behavioural belief factor and subjective norm, which is the social variable (Ajzen & Madden, 1986). These factors represent the extent to which a person considers the intended behaviour to have good outcomes and the social pressures associated by or not conducting the behaviour in question, respectively. The third factor, which is intention, determines the power associated with the individual's intent to carry out a certain action. With all of this taken into account, it may then be stated that the Theory of Reasoned Action can be viewed as having a mathematical core, whereby it may be used to predict behaviour on the basis of intention, which is, itself, reliant upon not only the subjective norm but also the individual's overall attitude.

3.2.1.1 **The Application and Limitations of TRA**

Essentially, the Theory of Reasoned Action, as introduced by Ajzen & Fishbein (1980), is a flexible framework used to explain conscious behaviour. Ajzen (1985) further supports this notion when he surveyed a number of researches that adopted TRA. For example,

- 'Cooperation in Prisoner's Dilemma Game' by Ajzen (1971)
- 'Having Another Child' carried out by Vinokur-Kaplan (1987)
- 'Choice of Career Orientation' by Ajzen & Fishbein (1980)
- 'Use of Birth Control Pills' by Ajzen & Fishbein (1980)
- 'Voting Choice in 1976 Presidential Election' by Ajzen & Fishbein (1980)
- 'Having an Abortion' conducted by Smetana & Adler (1980)
- 'Smoking Marijuana' as carried out by Ajzen *et al*. (1982)
- 'Infant Feeding' by Manstead *et al.* (1983)
- 'Explain Physician Intention to Prescribe Emergency' by Sable*et al.* (2006)

All these pieces of research demonstrated that intentions could be predicted based on subjective norms and the individual's overall attitude.

In the same vein, a meta-analysis was conducted by Sheppard *et al*. (1988), which considered 86 different researches, all of which were concerned with TRA. The analysis subsequently determined that there was an average correlation (0.54) between actions and intentions. With this taken into account and owing to the fact that the theory in question was created with the aim of describing the majority of human behaviour, it is considered that TRA, therefore, may be applicable to studies seeking to determine utilisation behaviours (Davis *et al*., 1989). It is suggested by Ajzen (1985) that the theory is able to provide a good degree of accuracy when predicting conscious behaviour, however, he importantly points out that intention should not be the only factor taken into account when seeking to predict both conscious and subconscious behaviours;. In other words, this theory is most applicable when considering conscious behaviour (Ajzen, 1988). This means that TRA is only applicable when seeking to predict a lesser range of behaviours. Another limitation is that the model is unable to generalise all the behaviours owing to an individualistic approach and to take into account the role of environmental and structural issues. This is because humans may change their behaviour that result in changes to their beliefs and attitudes (FHI, 2002). These limitations have called for a further expanded mode, which seeks to address the prediction of subconscious behaviours, i.e. those that are not fully controlled or intentional. As a result, a subsequent model was developed, known as the Theory of Planned Behaviour (TPB) by Ajzen (1988), which is described in the next section.

3.2.2 THEORY OF PLANNED BEHAVIOUR (TPB)

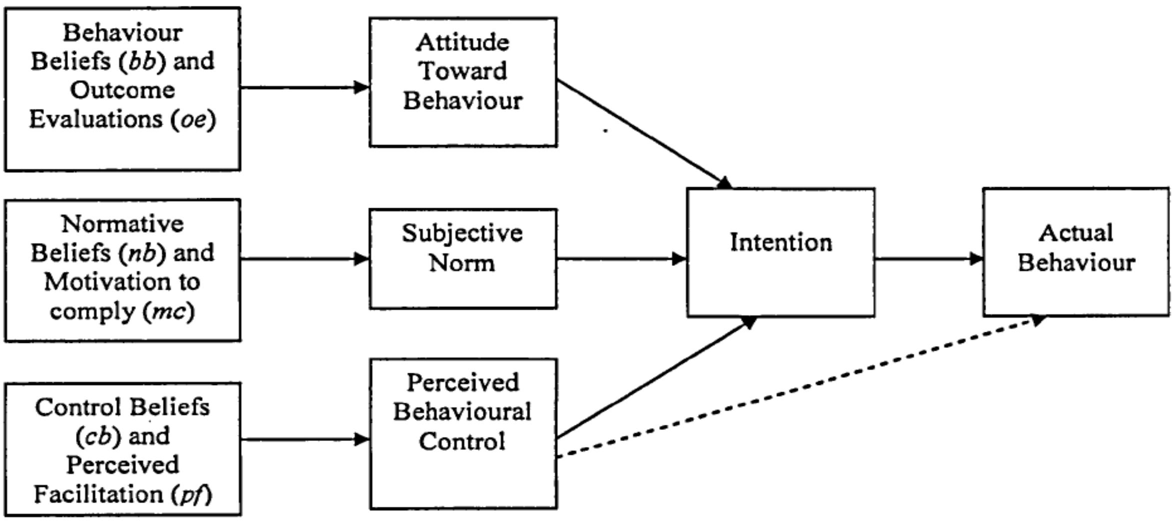
The Theory of Planned Behaviour as developed by Ajzen (1985; 1987; 1991) is an expanded model of the Theory of Reasoned Action introduced by Fishbein & Ajzen (1975) and Ajzen & Fishbein (1980). The TRA was further developed to comprise perceived behavioural control (PBC) as an additional factor apparent between intention and behaviour. Importantly, as highlighted in the previous section, this model overcomes the notable problem of volitional control, as there are a number of factors both internal and external that can affect control and behaviour, such as, abilities, adequate planning, knowledge and skills (internal affecters) and behaviour dependence (i.e. on outside people’s cooperation), time and opportunity (external affecters). Obviously, such factors together affect the level of control and consciousness when conducting behaviours. Essentially, the individual requires various components to come together i.e. resources and opportunities, together with intention in order to facilitate the behaviour being carried out (Ajzen, 1991). With this in mind, it is therefore clear to see that the degree to which the person is considered able to ensure control over their behaviour is an important consideration when seeking to ensure precise behavioural predictions (Ajzen & Madden, 1986).

Figure (3.2) below highlights two different models of TPB and as can be seen there are three different factors associated with the theory, namely, attitude, perceived behavioural control and subjective norm, all of which contribute to establishing intention, which subsequently facilitates establishing the behaviour.
The first version of the TPB considers the notion that behaviour is carried out as a direct result of intention with intention being viewed as the instigator behind the action (Ajzen & Madden, 1986). On the other hand, however, the second version of the model reflects on the possibility that PBC can be positively related directly to behaviour, which is depicted by the dotted arrow; in other words, this second version portrays the notion that PBC may have an indirect effect on behaviour. Essentially, therefore, it may be stated that PBC has the ability to suggest the availability of opportunities and resources, both of which are believed to facilitate subconscious behaviours that cover the previous described limitation of TRA.

In the view of the Theory of Planned Behaviour, there is the statement that human behaviours are directed based on three different types of belief: behaviour, normative and control. Behavioural beliefs are believed to create either a positive or a negative attitude in relation to the behaviour; normative beliefs may produce social pressures relative to subjective norms; and control beliefs may induce apparent behavioural control. Taking each of these three beliefs into consideration, their combination together may contribute to behavioural intention, which in turn acts as the fundamental determinant of behaviour.

Figure 3-2The Theory of Planned Behaviour (TPB)

Version 1 without the dotted arrow; Version 2 with the dotted arrow source: (Ajzen, 1991).



3.2.2.1 **The Application of TPB**

The Theory of Planned Behaviour was developed with the aim of predicting and describing human behaviour in relation to a number of different circumstances, as well as to cover the limitations of TRA (Ajzen, 1985). Subsequently, Ajzen & Madden (1986) carried out research to test the validity of the first version of TPB and found the results to be reliable, while the concept of perceived behavioural control significantly contributed to the overall reliability associated with the assessment of behavioural intention. Ajzen (1991) stated that a number of factors, namely, attitude, perceived behavioural control and subjective norm had been established and were capable of predicting the intention to carry out various behaviours with a significant level of precision. Furthermore, it was noted that when combined with perceived behavioural control, intention was found to be predictable for behaviours that were consummated.

Importantly, this has been supported by a number of different researches, which state that the model had improved compared to the TRA one (Albarracin *et al*., 2001; Armitage & Conner, 2001; Courneya & Bobick, 2000; Rhodes *et al.*, 2006;Sheeran *et al.*, 2003;Skar *et al.*, 2008).

In addition, in relation to the second version of the TPB (dotted), Ajzen & Madden (1986) state that the PBC was able to impact behaviour independently without relation to its effects on intention at the time when adequate data was determined so as to enable a comparatively precise valuation of behaviour control. Ajzen & Madden (1986) stated, however, that this value is possible only in the instance where two different conditions are in effect. Firstly, the PBC must be realistic and secondly, the behaviour, to some degree, must be established factors that are independent of an individual's control. A number of different scholars have drawn comparisons between TRA and TPB and subsequently assumed that at least in terms of physical activity, the TRA may be considered inferior to the TBP when considering the two in terms of intention variance. This may be due to perceived behavioural control, which has previously been established as having a significant effect on intentions of physical actions in TPB. For instance, a meta-analysis was carried out by Hausenblas *et al*. (1997), which considered of 31 different pieces of research. The analysis assumed that TPB is superior to TRA in terms of predicting intentional behaviours. Furthermore, Werner (2004) stated that as much as 20% intention variance might be rationalised because of PBC. This was stated following the review of several published researches. Moreover, Ozer & Yilmaz (2011) supported this view and inferred that TPB was superior to TRA.

Although the TPB model overcomes the various limitations of the TRA and extends it the former is considered to possess greater intention-predicting capabilities, however, only a few researchers have adopted it. This means that insufficient empirical research exists for studying acceptance of technology using this model (Leong, 2003). Another limitation of TPB is that it does not include personal background factors, culture factors and demographic variables. In addition, TPB hypothesises that perceived behavioural control predict actual behavioural control, which may not always happen (Sharma, 2007).

With the abovementioned taken into account and in an attempt to provide a deeper understanding of the factors contributing to user acceptance in the context of computing technologies, David (1986) chose to develop further the work of Ajzen & Fishbein (1980) by adapting the TRA. Subsequently, a new theoretical framework was developed, which was purposely aimed at reviewing user acceptance of computer-based data systems. This particular model was referred to as the Technology of Acceptance Model (TAM) and it will be described in the next section.

3.2.3 TECHNOLOGY ACCEPTANCE MODEL (TAM)

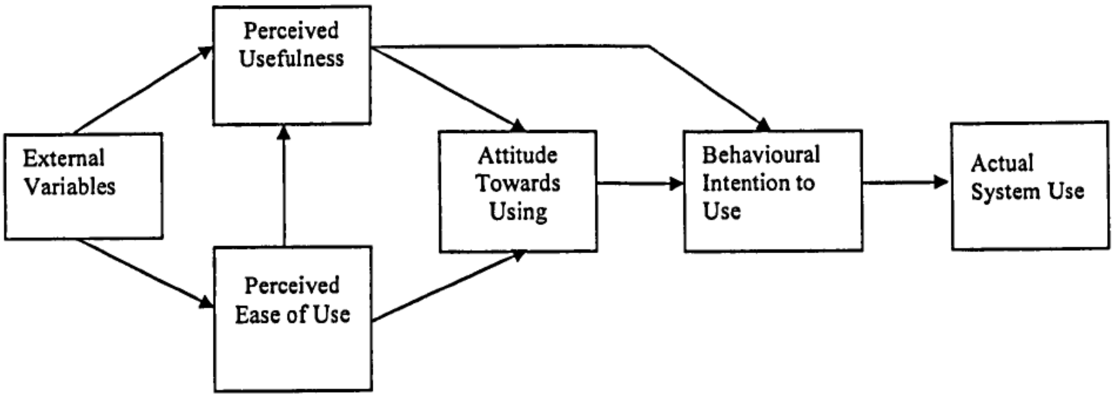
Originally, the TAM was formulated and developed by Davis (1986) with the aim of reviewing and analysing the impacts of system features in relation to user acceptance in the context of computer-based data systems. As explained above, this model was created because of the TRA, which was itself created and introduced by Ajzen & Fishbein (1975).The Technology Acceptance Model was designed in an effort to establish important factors associated with computer acceptance, as determined through a series of prior studies using the TRA as a hypothetical model in order to explain user acceptance of technology based on their perceptions (Davis *et al*., 1989).

In particular, the TAM is much more specific than the TRA owing to the fact that it was created with the overall purpose of being applied to the context of computer utilisation

(Davis *et al*., 1989). The past 15 years have witnessed significant implementation and application of the TAM with both practitioners and scholars testing, predicting and explaining in-depth the user acceptance of technology.

Figure 3-3Technology Acceptance Model (TAM).

Source: Davis *et al*. (1989)



Much the same as the TRA, the TAM proposes that the utilisation of computers is established through behavioural intention. This is in contrast to the TRA, which focuses on attitude and perceived usefulness. The fundamental distinction to be made between the TAM and the TRA is that the former does not consider the subjective norm as a factor that influences behavioural intention. This factor, therefore, is not included within this model, as it is not viewed as being relevant when seeking to rationalise and describe the concept of behavioural intention. Furthermore, as supported by Ajzen & Fishbein (1975), the factor of subjective norm is not well understood in terms of the Theory of Reasoned Action, whereas perceived ease of use and perceived usefulness together predict attitude. In contrast, however, it is considered that perceived usefulness is the result of various external variables in combination with perceived ease of use, whilst perceived ease of use is established as an outcome of various external variables. The original TAM model includes the constructs of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude towards Use, Behavioural Intention to Use and Actual System Use (Davis, Bagozzi & Warshaw, 1989). With the ability of the TAM to explain the acceptance of technology, the two main constructs of belief in the model are perceived usefulness (PU) and perceived ease of use (PEOU). These factors are described briefly in the following subsections.

3.2.3.1 **Perceived Ease of Use (PEOU)**

The concept of perceived ease of use, otherwise referred to as PEOU, is defined by Davis (1989, p. 320) as, “The degree to which a person believes that using a particular system would be free of effort”. It is considered that PEOU is associated with the evaluation of factors inherent in IS, such as, clarity of interfaces, ease of learning, ease of use and flexibility. Significantly, a system requiring a lesser degree of effort is considered a preferred choice when compared with a complex, time-consuming system that requires more investment (Davis, 1989). Essentially, the fundamental consideration in terms of system use relates to the effort required by the user when seeking to use the system. Chau (1996) stated that effort is a limited supply and so a user may ultimately opt to utilise simpler systems or means in order to achieve the same objective.

3.2.3.2 **Perceived usefulness (PU)**

The term perceived usefulness, otherwise referred to as PU, is defined by Davis (1989, p. 320) as,“[When] a person believes that using a particular system would enhance his or her job performance.” It, therefore, may be stated that PU relates to an individual’s view that utilising a certain system or technology may subsequently aid them in achieving better performance. It, therefore, may be highlighted that the decision whether or not a certain technology should be utilised is commonly linked with the perceived outcome, i.e. perceived usefulness. This is supported by the study of Davis *et al*. (1989)

when they found that there is a significant relationship between system utilisation and perceived usefulness, which, therefore, should be considered when seeking to either design or adopt systems.

3.2.3.3 **Attitude towards use**

An individual's overall attitude in the context of system utilisation relates to his/her own assessment concerning the appeal in utilising a certain application or technology. Davis (1986) considered perceived usefulness as being the effective mediator between beliefs (ease of use and usefulness) and behavioural intention to use. Numerous studies have reported that attitude towards use is a strong determinant of intention to use, and has a positive relation with intention to use (Lu *et al*., 2003; Yu *et al*., 2005; Ha and Stoel, 2009). Studies in information technology regularly report that user attitudes are important factors affecting the success of the system; most theories consider attitude to be a relationship between a person and an object (Davis 1989). A consistent finding from prior research is that user attitude toward new technology is a key factor for successful deployment (Davis *et al.,* 1989; Mathieson, 1991; Adams et al., 1992; Hu *et al.,* 2005).

3.2.3.4 **Behaviour intention to use**

Behavioural intention may be described as the degree to which a person aims or expects to carry out a certain action (Davis *et al*., 1989). Behaviour intention may be otherwise described as a tool for gauging the possibility that an individual may utilise a system.

3.2.3.5 **External variables**

Despite the fact that studies in the context of TAM have provided significant value and insight into comprehending and appreciating users' intentions and actual utilisation (Adams *et al*., 1992), specifically in the context of IT, nevertheless, it is noted that such researches have simply focused on only two usage-related factors: perceived usefulness and perceived ease of use. With this in mind, whilst the Technology Acceptance Model states that individuals will utilise computer technology if they believe it will result in a positive outcome, it nevertheless does not suggest which specific external factors may have an impact on the two belief constructs, i.e. perceived ease of use and perceived usefulness (Liaw, 2001; Wu & Chen, 2005). Accordingly, any external influences believed to impact PU and PEOU are, therefore, dismissed. In their study, Davis *et al*. (1989) ignored these external variables and only focused on the remaining constructs and the relationships between them.

In connection with the above, Venkatesh (2000) subsequently stated that researchers in this field have limited development in terms of their own findings owing to the fact that they have chosen to consider certain variables without attention to others, such as, design characteristics and training, which may ultimately be useful. There are numerous studies, which have investigated the impact and importance of external factors in the PU and PEOU, such as, Taylor & Todd (1995a), Igbaria & Iivari (1995) and Hubona & Kennick (1996).More recent studies in this area includethe work of Srite (2006), Wu & Chen (2005), Mahinda & Whitworth (2005), Al-Gahtani (2008), Chuang *et al*. (2009), Saade (2007), Yuan (2005), Wu & Chen (2005), Mahinda & Whitworth (2005), AL-Gahtani (2008), Baran (2009), Sahin & Shelly (2008), Wang & Wang (2008), Chatzoglou *et al*. (2009) and Rigopoulos & Askounis (2007).

Table (3.1) shows previous and recent studies using the TAM as a theoretical base model for research that has been conducted during the last two decades. The table highlights the TAM with respect to the implications and testing for the validation of both PU and PEOU. It is suggested that in order to gain a deeper understanding of user acceptance in the context of virtual learning environments, the fundamental TAM concepts of PU and PEOU, as well as their antecedents, should be fully understood (Chin & Gopal, 1995; Venkatesh & Davis, 1996). Importantly, gaining an in-depth understanding of the factors that play a role in PU and PEOU is essential, as it is believed that this would aid in creating influential and powerful aspects to ensure a positive outcome for the research, and thereby promote further utilisation and user acceptance. Accordingly, the antecedents of PU and PEOU will be described in the subsection below.

Table 3-1Summary of studies of the TAM model and results

Source: Swesi (2008) and updated by the researcher for recent studies

Researcher's Name(s)	Year	Applications used	TAM Implication
Davis	1989	Computer usage, E-mail, graphic software	Valid and reliable
Davis *et al*.	1989	Word processor	PU and PEOU related to usage
Mathieson	1991	Spread sheet	Valid PU and PEOU, TAM more predictive than TRA
Adams *et al*.	1992	E-mail software	Mixed results
Straub *et al*.	1993	Voicemail	PU and PEOU explain more variance in self-report
Rice & Aydin	1991	E-mail	PU, PEOU and attitude were valid
Segars & Grover	1993	Voice and email software	Antecedents of usefulness-increased productivity, antecedents of effectiveness increased performance and effectiveness. Antecedents of PEOU were easy to learn and
Szajna	1994	Bibliographic software	Relationships of TAM constructs were valid
Igbaria *et al*.	1995	Computer usage	Valid and reliable constructs, all independent variables had an effect on PU
Igbaria & Livari	1995	Computer usage	TAM models were all significant
Taylor & Todd	1995	PC use	The augmented TAM provided a suitable model for IT usage; determinants of BI were significant except attitude, strong link between experience of user and BI.
Keil *et al*.	1995	Expert system	Relationships between PU and PEOU were strong.
Szajna	1996	Database management system	TAM is valuable tool for predicting use, with PU & PEOU were valid
Szajna	1996	e-mail system	PU and PEOU had direct effect on BI
Venkatesh & Davis	1996	Word processor, lotus	Strong relationship between computer self-efficacy and PU, objective usability had influence on PU after experience
Chau	1966	Word and Excel software	Both PU near-term and PU long-term had significant effect on BI

Agarwal & Prasad	1997	Web sites (WWW)	Independent variables used in study had significant relationships with usage.
Straub *et al*.	1997	E-mail use in cross-culture	PU & PEOU valid in US and Switzerland case much more than in Japan case
Gefen & Straub	1997	Use of E-mail and perception	Gender was strong antecedent to PU and use, resulting in PU significantly affecting use.
Pijpers *et al*.	2001	Executive information system	The study support core TAM, which found valid with factors have indirect impact to use
Veiga *et al*.	2001	IT application	TAM constructs valid in cross-culture
Seyal *et al*.	2002	Internet use	The internet usage was dependent on ease of use more than useful.
Masrom	2007	E-learning	Significant relationships between PU &PEOU and attention to use e-learning
Lai & Honglei	2005	Internet banking	PU & PEOU strong determinants of BI
Sahin & Shelly	2008	Distance Education	PU & PEOU significant determinant of BI.
AL-Gahtani	2008	Computer application	Moderating human factors have significant impact on PU & PEOU.
Wang & Wang	2008	Online game	Playfulness and challenge factors are significant and influenced into PU & PEOU.
Vrielink,	2008	Web-based technology	PU has important role than PEOU in using VLE
Van Raaji & Schepers	2008	VLE	PU & PEOU are valid but PU have direct impact on attention than PEOU
Poelmans *et al*.	2008	VLE	PU is more predictable on behaviour intention to use VLE than POEU
Milis *et al*.	2008	VLE	Gender has impact on PEOU than PU (male has positive attitude more than female)
Chatzoglou *et al*.	2009	Web-based training	PU & POEU influenced by external factors and they were found strongly related to BI.

3.2.3.6 Predictors of PU and PEOU

In order to explore more variables, which are external and antecedents to the TAM belief constructs PU and PEOU, researches into IS have been conducted to develop, extend and modify the TAM so that it can add value to understanding system usage. Regarding its importance and in an attempt to maximise the variance of the model, the researchers have considered the relationships of the external variables of the TAM with its impacts on PU and PEOU. In connection with this, Legris *et al*. (2003) stated that the TAM could predict a system to only 40% of its variance, without including external variables. Moreover, by considering this slightly high variance, the researcher first, decided to include similar external factors from a previous study (Swesi, 2008) in order to increase it. Secondly, in order to ensure the worth of the research mode. Thirdly, what variables had previously been validated that withhold a significant impact on PU and PEOU. Fourthly, in order to answer the research questions, such as, specialisation impact, gender group and the moderation effect of learning styles between external factors and PU and PEOU, which will discussed later in the chapter. Legris *et al*. (2003), however, argued that there are limited contributions to system usage when the external variable is included. Igbaria *et al*. (1994), Anandarajan *et al*. (2002), and Taylor &Todd (1995), however, felt that external variables increase understanding of the system's use via PU and PEOU with their antecedents having an influence on the belief constructs of the TAM; thus, resulting in an increase for the prediction of the acceptance level. As an example, self-efficacy has approximately 18% of the variance in individual usage as recognised by Compeau *et al.*(1999). Similarly, Venkatesh &Davis (2000) included external variables (subjective norms, image and voluntariness) and established that the antecedents of PU and PEOU are able to increase the variance.

As described above the researcher intends to include the external factors of a previous study by Swesi (2008) in the current research. These will be described in the next section. It is singular for a researcher to integrate a learning style model into the present research model in order to increase the understanding of the acceptance of VLE from the perception of the students.

According to the literature on TAM, about 30–40 different variables have been used from different regions and cultures. It is important here to describe and present the previous external factors used in various applications and from various countries in order to explore and add new knowledge to the literature. In addition, to determine how this study can fill the gap that exists in order to assist in developing a new model that may be able to increase the explanatory power of TAM model. The tables below show variables, which represent antecedents of both perceived usefulness (PU) and perceived ease of use (PEOU). Table (3.2) and Table (3.3) show the different antecedents of PU and PEOU, which have been used in previous research. In order to include antecedents of PU and PEOU in the research model that is described in chapter five, the next section explains the antecedents of PU and PEOU, which will be involved in this research.

Antecedents of perceived usefulness (PU)

Table 3-2Antecedents of perceived usefulness (PU)

Source: Swesi (2008)

Antecedents	Year	Researcher	Antecedents	Year	Researcher
Computer anxiety	2000	Venkatesh	Management support	1997	Igbaria *et al.*
Computer self-efficacy	2001; 2003;1999	Hung & Liang; Stone & Henry; Compeau & Higgins	Facilitating condition	2001	Chang & Cheung
Computer playfulness	2000	Venkatesh	External computing support	1997	Igbaria *et al.*
Computer experience	2000	Venkatesh & Davis	Internal computing support	1997	Igbaria *et al.*
Cultural affinity	1994	Phillips *et al.*	Image	1991; 2000	Moore & Benbasat; Venkatesh & Davis
Critical mass	2004	Hsu & Lu	Institutional support	2001	Pijpers *et al*
Intrinsic motivation	2000	Venkatesh	Organisational support	1998	Anandarajan *et al*
Job relevance	2000	Venkatesh & Davis	Organisational usage	1996	Igbaria *et al.*
Job characteristics	1998	Anandarajan *et al.*	Output quality	2000	Venkatesh & Davis
Level of education	2005	Burton-Jones & Hubona	Perceived enjoyment	2000	Venkatesh
Age	1993; 2005	Igbaria; Burton & Hubona	Perception of external control	2000	Venkatesh
Gender	2000	Venkatesh & Morris	Perceived risk	2002	Philips
Subjective norms	2000	Venkatesh & Davis	Personal innovativeness	2003	Lewis *et al.*
Social influence	1997	Igbaria *et al.*	Playfulness	2000	Venkatesh
Social pressure	2000	Anandarajan *et al.*	Self-efficacy	1995	Igbaria & Livari
Social norms	2004	Hsu & Lu	Complexity	1996	Igbaria *et al.*
Social norms: professional peers	2003	Lewis *et al.*	Experience	2000	Venkatesh
Peer influence, superior influence	1995	Taylor & Todd	Task characteristics	1987	Saga & Zmud
Psychological Attachment	1999	Malhotra & Galletta	Task variety	1992	Ghani
Top management commitment	2003	Lewis *et al.*	Specialisation	2008	Swesi
User training and support	1997	Igbaria *et al.*			

Antecedents of perceived ease of use (PEOU)

Table 3-3Antecedents of perceived ease of use (PEOU)

Source: Swesi (2008)

Antecedents	Year	Researcher	Antecedents	Year	Researcher
Computer anxiety	2000	Venkatesh	Tenure in workforce	1999	Agarwal & Prasad
Computer experience	2000	Venkatesh and Davis	User training and support	1995	Igbaria *et al.*
Computer self-efficacy	2001	Chau	Age	1993; 2005	Igbaria; Burton & Hubona
Playfulness	2000	Venkatesh	Cultural affinity	1994	Phillips *et al.*
Computer skills	1996	Igbaria *et al*.	External computing support	1997	Igbaria *et al.*
Organisational support	1998	Anandarajan *et al*.	Internal computing support	1997	Igbaria *et al.*
Organisational usage	1996	Igbaria *et al.*	Compatibility	2001	Chau & Hu
Perceived enjoyment	2000	Venkatesh	Level of education	1999	Agarwal & Prasad
Perceived system quality	1995	Igbaria *et al.*	Objective Usability	2000, 1997	Venkatesh; Igbaria *et al.*
Personal innovativeness	2005	Yang	Subjective norms	2000	Venkatesh & Davis
Internet self-efficacy	1998	Anandarajan *et al.*	Complexity	1996	Igbarai *et al.*
Gender	1997	Gefen & Straub	Voluntariness	2000	Venkatesh & Davis
Social influence	1997	Igbaria *et al*.	Specialisation	2008	Swesi
Social pressure	2000	Anandarajan *et al*			

3.2.3.7 Antecedents of PU and PEOU in the present research

In order to answer the research questions that relate to various external variables and their influence on the acceptance of VLEs, the following section provides a description of the selected variables that are considered antecedents of PU and PEOU in order to predict the intention of using VLE in Libyan universities from the perception of the students.

3.2.3.7.1 Gender

Previous IS studies have discussed gender differences, particularly in the area of technology acceptance. Most studies have reported that females have less overall experience with technology, especially computer systems, and their participation in using this technology will reflect in their attitudes towards it (Schumacher & Morahan, 2001). A number of researchers have been amazed by the findings on gender differences, such as, Gefen & Straub (1997), Venkatesh &Morris (2000) and Wang &Wang (2008).

In the study conducted by Gefen &Straub (1997), who investigated the perception of using e-mail systems, it was found that women rather than men perceive it to be more useful. Men, however, were more comfortable using computers. This result is inconsistent with studies, such as, Sherman *et al*. (2000) Sanders &Morrison (2001), Anderson (2001) and Jakobsdottir (1999). In contrast to this, however, Venkatesh &Morris (2000) emphasise that men have more value of perceived usefulness compared to women in terms of using technology, whilst women are affected by ease of use and social influence. They suggest further investigation is needed in order to determine the impact of gender as antecedents of PU and PEOU.

Regarding the difference between genders in the last decade, Sherman *et al*. (2000) investigated this case and reported various differences between the genders in terms of the use and optimisation of a technical computer, understanding the methods of use and in their level of experience in this area.

The study, however, indicates that, during the 1990s, males were more experienced with internet use than females and the attitude towards the internet was different between genders, although these differences remained stable across the period of the study.

Relating to the use of WebCT amongst genders, a survey that included 200 students at university was conducted by Sanders &Morrison (2001), which investigated the attitude and behaviour of both males and females. The researchers subsequently reported that learning via web-based methods was positive. The participants were satisfied with the use of WebCT as it involved the sharing of information and communication with each other. Female satisfaction was found to be greater than male. This is because the learning environment is more complex than any other application, including interaction, solving problems, critical thinking and communication.

The Technology Acceptance Model has been applied in different IS studies to investigate the usage of technology, reporting the significant differences across cultures. Regardless of these differences, the importance of gender was ignored (Gefen &Straub, 1997). Notably, gender is a fundamental aspect of culture, “Indeed, socio-linguistic research has shown that men tend to focus discourse on hierarchy and independence, while women focus on intimacy and solidarity.” (Gefen & Straub, 1997, p.389) These researchers suggest that gender should be included in IS research. A recent study by Wang &Wang (2008) modified the TAM model to investigate the differences in terms of accepting online games. The results show that males are more concerned and interested in playing online games than females. Furthermore, they suggested that the designer should focus on gender differences to attract females into the design of a suitable game for them.

It is clear from the IS literature review that gender has not received attention from previous studies; even Davis’s original and modified model has ignored the importance of gender impacts on the model, as stressed by Adams *et al*. (1992), Chin & Gopal (1995), Moore & Benbasat (1991) and Igbaria *et al*. (1995). Moreover, gender is not examined in IS models (Markus &Cross, 1993; Szajna & Scamell, 1993). A few researches, however, consider gender differences and impacts on the acceptance of VLEs, for example, Milis *et al*. (2008) conducted a study to explore the gender impacts on the acceptance of VLEs linking their acceptance to gender and learning attitudes. They also included two factors in the TAM model, namely, system and information quality, as independent variables that explore the differences between gender groups. Based on the finding, the study found that a digital gap existed between males and females, which have led to lowering the level of acceptance by female students. Further, Neuforn (2007) carried out research that explored the gender gap in the perception of VLEs. The findings reveal that females less commonly use written messages than males. He reports that females need some sort of support when using VLEs in order to increase online interaction. Furthermore, Mansour (2004) found various gender differences between males and females regarding their attitudes. Wang & Wang (2008) modified the TAM model to investigate the differences in terms of accepting online game. The study found that male accept to play game online than female, they suggested that the designer should focus on gender differences and focus on designing games suitable for female.

In the past have often considered computer and its application along with the revolution of the Internet usage and adoption as male dominated, and numerous previous studies have documented these significant differences in the adoption of technology, with male have appositive attitudes towards use because the skills they have hold (Ong and Lai, 2004). Owing to the present research aiming to investigate the influence of factors that may be relevant when using VLEs, gender is recognised as an antecedent of PU and PEOU.

3.2.3.7.2 Subjective Norms

According to TRA, developed by Ajzen &Fishbein (1980), a subjective norm is a very important construct that can affect the behaviour of a person. In this research, the purpose is to show the impact of social influence as a main independent factor that relates to the use of VLEs. The study includes the factor owing to previous findings of its influence upon the model.

Subjective norms, as defined by Ajzen &Fishbein (1980, p.122) is, “An individual’s perception of whether people important to the individual think the behaviour should be performed.” Alternatively, the influence of social pressure directed at a person to perform or not perform the behaviour (Azjen &Fishbein, 1980). In their study, they found a significant relationship between subjective norms and behavioural intention. Similarly, Venkatesh & Davis (2000, p.187) define a subjective norm as, “As a person’s perception that most people who are important to him think he should or should not perform the behaviour in question.”

Subjective norms are considered a social factor and an individual may do or tends to conduct a particular behaviour because he/she believes people important to them would like to (Venkatesh &Davis, 2000). In the case of technology use, subjective norms may not have a direct impact on intention when technology is voluntary, as stated and hypothesised by Venkatesh & Davis (2000), and vice versa. It, however, can be stated that this depends on culture differences, which may play a vital role in terms of impacts in the case of mandatory or voluntary use. Accordingly, as mentioned by Anandarajan *et al*. (2000), the subjective norm factor is linked to cultural norms. The result of an individual’s response to social pressure depends on their culture, for example, a result that may be found in America, is not necessarily the same as a result found in a different cultural setting or a different country, as mentioned by Hofstede (1984).

One of the limitations of the original TAM is that it does not include social factors, such as, subjective norms, with their importance in maximising the variance of the model. Notably, this was reported by Yu *et al*. (2005) who established the significant relationships between subjective norms and intention via perceived usefulness. Similarly, a study by van Raaij & Schepres (2008) included subjective norms in the model and they hypothesised they influence VLE use via PU and in addition the latter directs attention to the use of VLE. The findings report that subjective norms have indirect effects via PU.

There are many different names, which have been used by IS research for social factors as an extension of the TAM, namely, social factors, external competitive pressure, external pressure, social pressure and social influence. These factors hold similar characteristics and they are considered to fall under the same umbrella of social factors. For example, Anandarajan *et al*. (2000) have used social pressure, which holds a similar idea of subjective norms, claiming that social pressure has strong relationships with intention to use technology. This is a significant relationship via PU, the result of which was consistent with Yu *et al*. (2005). Table (3.4) shows the subjective norms factor, which has been used in IS research for adoption and acceptance of technology.

Table 3-4Social factors that have been used by researchers on MIS

Source: Swesi (2008)

Construct	Author	Year
Subjective norms	Venkatesh & Davis Reimenschnider *et al*. Venkatesh *et al*. Jasperson *et al*. Malhorta & Galleta Lee *et al*. Swesi van Raaij & Schepres	2000 1999 2003 1999 1999 2001 2008 2008
Social pressure	Anandarajan *et al.*	2000
External pressure	Mehretens *et al.*	2001
Social influence	Lewis *et al.* Chin-Lung & Hsi-Peng	2003 2003
External competitive pressure	Premkumar & Roberts	1999
Social factor	Chang & Cheung	2001
Psychological Attachment	Malhotra & Galletta	1999

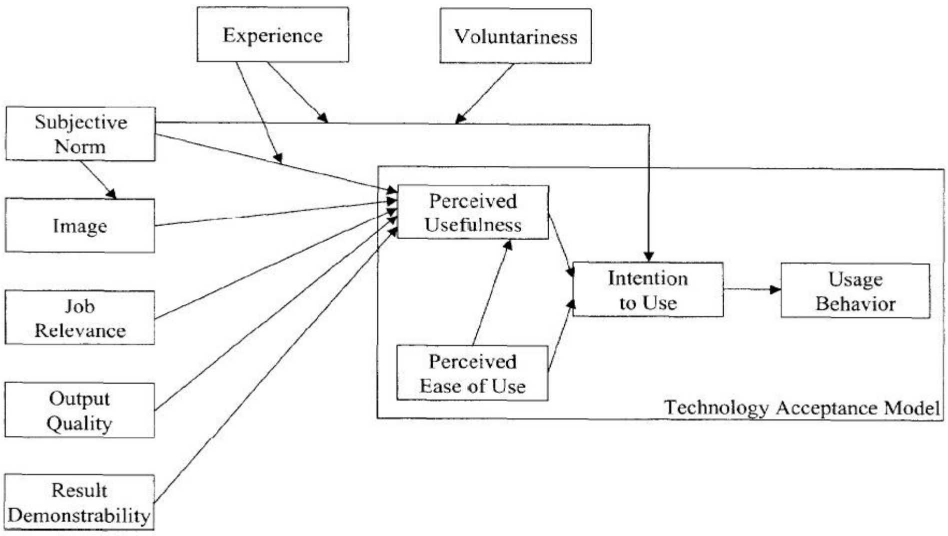
According to Davis (1989) and Davis *et al*. (1989), subjective norms should be researched, particularly in the case of the TAM model. They reported, with reference to the TRA model, that behavioural use of technology might be caused by another person's influence. This factor, therefore, is considered an important one that can play a significant role in the acceptance of new technology.

3.2.3.7.3 Job Relevance

Job relevance can be defined as perceiving that a particular job is pertinent (Venkatesh &Davis, 2000). Figure (3.4) shows the construct used by their study and includes subjective norms as antecedents of PU. They found that job relevance has a significant relationship to PU. Another study by Kim (2008) applies job relevance as a moderated factor to explore its effect in mobile wireless acceptance. The moderating effect of job relevance was also found to be significant. The effect of this construct has not been examined by previous studies. Chismar & Wiley (2003) found that physician accept technology (internet-based health information) because they feel it is relevant to their jobs, and he reported the positive impact of job relevance on usefulness. Furthermore, Hart & Porter (2004) confirms the positive relationship of job relevance with usefulness in their research model. From the above, it is obvious that the job relevance factor is very important for inclusion in our study. This factor may play a significant role in accepting VLEs amongst students. Students may see that VLE is relevant to their study.

3-4 TAM2 model

Source: Venkatesh & Davis (2000, p. 188).



3.2.3.7.4 Experience

According to Ajzen & Fishbein (1980), prior experience is one of the determinants of behaviour intention to use. Thus, students' experiences may play a significant role in accepting new technology consistent with previous IS. For example, a study conducted by Taylor &Todd (1995) found differences between experienced and inexperienced users. In the results, it was highlighted that experience users as antecedents have strong relationships with PU. Similarly, Igbaria *et al*. (1995) stated that users of computer experience have a significant direct effect on usage via perceived usefulness and ease of use. They concluded that using technology depends on the level of experience of users. They posited that computer experience is positively related to beliefs constructs, PU and PEOU. This study, therefore, will adopt this hypothesis, as most Libyan students came from secondary schools where technology is absent. This may cause students to ignore or not accept VLE use without prior experience. Venkatesh &Morris (2000), however, stated that users increase their experience over time by using a technology, after which they can then make a better assessment of its benefits.

Agarwal &Prasad (1999), on the other hand, stated that users would accept technology if they have prior experience with it. As has been ascertained, in VLE literature that students' prior experience with VLE positively influenced their intentions, and how students able to interact and managed their online activities (Lee *et al.*, 2001; Shih *et al.*, 2006).Moreover, a recent study by Kim (2008) found that individuals adopt a technology if it is within their prior experience, i.e. if individuals have prior experience with similar technology. This was found by Lee *et al.,* (2001) who investigate the students' usage of VLE in college environment, the results show that student's prior experience revealed a strong positive impact on perceived usefulness. In addition it was stated by Karahanna *et al.* (1999) that when users achieve experience with the system, perceived usefulness is replaced by ease of use. Other studies have posited that experience has positive impact on ease of use, and has been found strong relationships with them as students using web-based learning coursework (Stoel & Lee, 2003, Lau & Woods, 2009).In the present research, VLE is considered new for Libyan students and it is the first time such a technology has been installed; thus, it is expected that students may face difficulties in adopting such a technology, which, therefore, leads to reductions in the variance of the research model.

3.2.3.7.5 Self-efficacy

Self-efficacy is defined as, *"People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with the judgments of what one can do with whatever skills one possesses"* (Bandura, 1982,p. 122).

In his social cognitive theory, Bandura (1994) describes self-efficacy as the attitude of individuals, which determine how they think, feel, motivate and behave and that attitude produces positive effects via four processes: cognitive, motivational, affective and selection. If the person doubts his ability to do the job, that doubt may prevent him/her from doing it (Igbaria & Ivari, 1995).

Numerous IS studies have included self-efficacy, sometimes it called the computer self-efficacy, both of which are viewed as one meaning (see, for example, Venkatesh &Davis, 2000, Stone &Henry, 2003; Hung &Liang, 2001; and Compeau &Higgins, 1999) as an independent variable. The factors show a significant role in influencing decision-making in information system usage and adoption. Another study by Gist *et al*. (1989) shows that self-efficacy is related to performance in software training, in the same research (see also Webster &Martocchio, 1992; Reid & Levy, 2009; Babic & Jadric, 2010).

In terms of the TAM beliefs constructs, Venkatesh &Davis (1996) have reported that computer self-efficacy has a strong relationship with PU and PEOU. On the other hand, self-efficacy has a greater impact on PEOU, as found by Agarwal *et al*. (2000). Recently, Wu *et al*. (2008)stated that computer self-efficacy is an important antecedent of both perceived usefulness and perceived ease of use; however, perceived ease of use has an adverse effect on perceived usefulness within the science-teaching context.

Similarly, Reid & Levy (2009) conducted a study to explore computer self-efficacy influence on the acceptance of banking information systems. The researchers subsequently established that the factor has a significant impact on the PU and PEOU and they reported that self-efficacy should be researched.

In the context of e-learning, Roca *et al.* (2006) include self-efficacy in their model to examine the capability of students to accept to use e-learning services. They hypothesised that the variable will influence only ease of use, the findings found that the self-efficacy is strong determinant of e-learning indirectly via ease of use. Similarly Liu (2010) reported that Wiki self-efficacy (internal control) significantly correlated with user's perception of ease of use and with the actual utilization of Wikis. Many other earlier results, such as, those published by Chau (2001), Venkatesh (2000), Hong *et al*. (2002), and Lewis*et al.*, (2003)are summarised in Table (3.5)and show the effect that computer self-efficacy has on PU and PEOU.

Table 3-5Computer self-efficacy used by researchers and its impact on PU and PEOU

Source: Swesi (2008) and updated by the researcher

Author	Year	Application	Impact on PU and PEOU
Igbaria & Livari	1995	Computer usage	Positive effect on PEOU
Venkatesh & Davis	1996	Computer usage	Positive effect on PEOU
Venkatesh	2000	Email	Positive effect on PEOU
Agarwal *et al*.	2000	Spreadsheet	Positive effect on PEOU
Chau	2001	Telemedicine application software	Insignificant effect on PEOU Negative effect on PU
Lewis, Agarwal & Sambamurty	2003		Positive effect on PEOU No effect on PU
Wu *et al*.	(2008)	Online Learning	Positive effect on PU & PEOU
Reid & Levy	(2009)	Bank information system	Positive effect on PU & PEOU
Liu	2010	Educational Wikis	Positive effect on PEOU

3.2.3.7.6 Specialisation

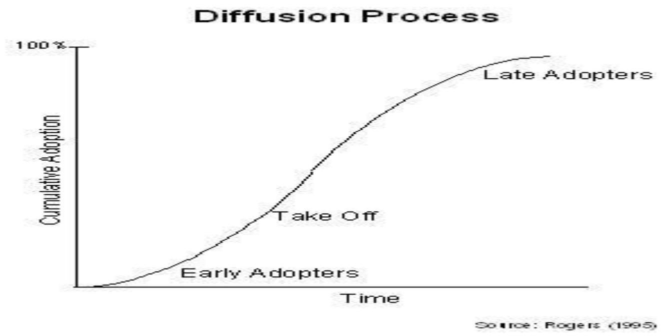
The results of previous research by Swesi (2008) showed, that student specialisation (their major) had a significant impact on the model in the case of linear regression analysis, in that natural and formal science students were more interested in using the internet than other groups of students who specialised in applied and social sciences. In the case of multiple regression analysis, however, a negative but significant relationship was found between specialisation and perceived usefulness. The negative sign shows that other specialisations have a lesser effect on PU compared with natural and formal science. The finding that a computer-related study background has a maximum effect on constructs, such as, PU and PE, self-efficacy, attitude and behavioural intention has been supported by their mean scores as well as by one-way ANOVA analysis. Swesi's findings (2008) may be considered a contribution to knowledge in the field of information systems. The author, therefore, included this construct in the present study to investigate its impact on both models (the TAM and Kolb's model) in an attempt to gather further evidence, which can contribute to this field.

3.2.3.7.7 Complexity

The complexity factor has been studied by various researchers in the IS area. The Innovation Diffusion Theory (IDT) has likewise been the subject of much research. Rodgers (1962) who developed the Diffusion of Innovation Theory (DOI) used complexity as one of the independent constructs. The history of DOI goes back to 1950 when it was used for research at the University of Chicago to study how, why and at what rate new ideas and technology spread through societies and cultures (Rogers, 1962). Rogers theorised that innovations would spread through society in an S-curve, as shown in Figure3.5, which explains that early adopters selected technology first, which is then accepted by the majority. Finally technology or innovation becomes common.

Figure 3-5Rogers's DOI curve

Source: Rogers (1995)



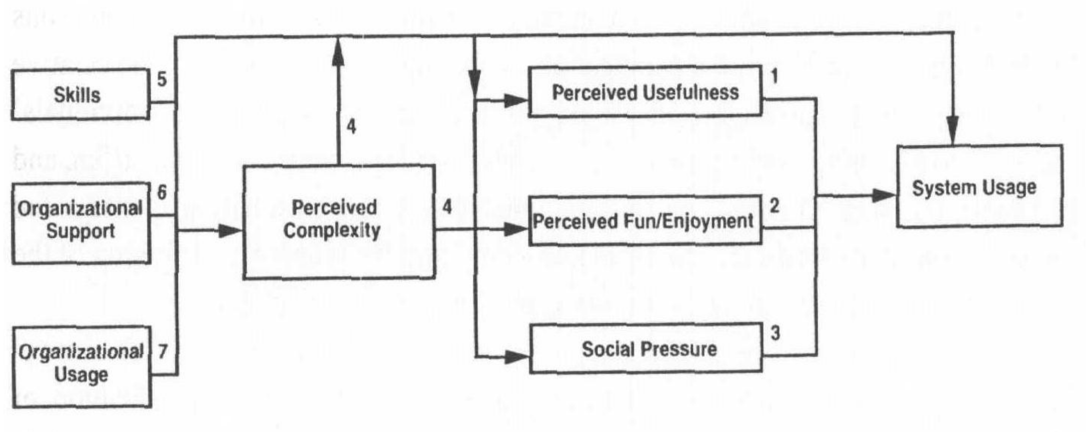
Rogers (1983) used the complexity factor as one of the main independent constructs in diffusion innovation theory, as developed by Rogers (1983, 1995). The other independent variables included relative advantage, observability, trialability and complexity, whilst computer adoption was a dependent variable (Rogers, 1983). Rogers and Shoemaker (1971) identified perceived complexity as the degree to which computer technology is viewed as being somewhat difficult to appreciate and use (Rogers &Shoemaker, 1971).In the same context, Rogers defines complexity as the degree to which innovation is perceived as being difficult to use (Rogers, 1983).

On the other hand, Igbaria *et al*. (1996) consider perceived complexity to be one of the characteristics of the ease of use construct, as defined and used by Davis (1989) who said, “The degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p.320).

In another study conducted by Webster & Martocchio (1992), it was reported that using a computer depends on perceived complexity if the factors playfulness and enjoyment are involved. Notably, they used complexity as an independent variable as a direct impact to PU where the latter was established as a dependent variable. They found a strong relationship between complexity and PU, which was inconsistent with the results established by Igbaria *et al*. (1996). Igbaria's work emphasised the significance of the relationship with PEOU instead of PU. It can be suggested, therefore, that if the technology is perceived as complex, it is not related to ease of use (see Figure 3.6).

Figure 3-6Motivational model of computer usage

Source: Igbaria *et al*. (1996)



In fact, Thomson *et al*. (1991)stated that perceived complexity is opposite to ease of use from the perspective of the users and it was found that the more complex the technology the lower the rate of adoption. Chau &Hu (2001) emphasise that with technology that is more complex and less experience in negotiating it, there was a reduction in the strong positive relationship between perceived usefulness and intention to use.

Igbaria *et al*. (1995), however, emphasised a strong relationship between complexity and perceived usefulness although, in their study they hypothesised that perceived complexity would be negatively related to computer usage, perceived usefulness, enjoyment, and social pressure. Parveen & Sulaiman, (2008) who investigate intention to use Wireless internet Using Mobile Device by examining the complexity that influence usefulness and ease of use. The result reported that complexity construct has medium impact both usefulness and ease of use and has increased the variance of their proposed model.

3.2.3.8 **TAM application and limitation**

The Technology Acceptance Model was first introduced by Davis (1986) and it has become widely recognised. Its application has been witnessed in a number of different researches and empirical studies. In comparison to other models in the same field, the TAM is considered less complex, stronger and more accurate in terms of its predictions (Venkatesh & Davis, 2000; Mahinda & Whitworth, 2005). Notably, there has been successful application of the TAM in a number of different end-user technologies (see Table 3.1) including, for example, research on VLEs (Lee *et al*., 2001; Stoel & Lee, 2003; Ong & Lai, 2004; Chang & Tung, 2008; Milis *et al*., 2008; Van Raaji & Schepers, 2008; Van Schaik, 2009; Doyle & Short, 2010; and Sumak *et al*., 2010). As the TAM has been extended to examine online education usage, it is appropriate to extend the model furtherto study VLE, such as, Blackboard's Course Management System (BCMS) technology, as it is closely related to previous TAM applications.

It is clear, therefore, that the TAM has been utilised across a large number of computer-related applications. This model has been validated by examining various types of technologies pertinent to individual and organisation adoption (see Venkatesh, 2000; Chau, 1996; Agarwal &Sambamurthy, 2002; Igbaria *et al*.,1997; Legris *et al*., 2003; Leong, 2003; Saade *et al*., 2004; Wu & Chen, 2005; Mahinda & Whitworth, 2005; Chuang *et al*., 2009;Rigopoulos *et al*., 2008).

The TAM is a parsimonious and theoretically justified model intended to explain information technology adoption (Yuan, 2005; Al-Gahtani, 2008).One of its limitations mentioned by Mathieson *et al*. (2001)is that it assumes there are no barriers that prevent an individual from using or choosing to utilise a particular technology. This may not be the case. Even if individuals perceive that VLE is useful and easy to use, they may nevertheless feel that they lack the skills or experience necessary to use it. Another limitation may be that the students feel forced to use a particular technology that answers the needs of the university rather than their own.

The Technology Acceptance Model (TAM) is generally referred to as the most influential and commonly employed theory in information systems (Lee *et al*., 2003). Some also consider it to be the only well-recognised theory in IS (Benbasat &Barki, 2007). Importantly, Davis's (1986) approach largely simplifies the TRA, as well as making it more efficient to conduct IT adoption research and facilitating the aggregation of results across settings. In this regard, the TAM can be viewed as very successful. Such success, however, sometimes has unintended consequences. As an alternative approach to eliciting salient beliefs in each specific case that are associated with an IT use context, Moore (1987) and Moore & Benbasat (1996) proposed the utilisation of a generic set of beliefs and the full complement of perceived characteristics of innovations (Moore & Benbasat, 1991) identified in Rogers's influential work on the Diffusion of Innovations (2003).

After approximately two decades of research and a large number of studies that investigated the TAM and its many modifications and expansions, we have reached certainty that perceived usefulness (PU) is a very influential belief and that perceived ease of use (PEOU) is an antecedent of PU and an important determinant of use in its own right. Unfortunately, however, in spite of its significant contributions in the IS field, the extreme focus on the TAM has led to several abnormal outcomes. According to Benbasat & Barki (2007) who have summarised these outcomes and they divert the attention of researchers of important issue on TAM. First, TAM-based research does not concentrate on the antecedents (external constructs) of its belief constructs (PU and PE) and most importantly on IT artefact design and evaluation. Second, TAM-based research has provided a very limited investigation into the full range of the important consequences of IT adoption. Moreover, TAM-based research has led to the creation of an illusion of progress in knowledge accumulation. In addition, the inability of the TAM as a theory to provide a systematic means of expanding and adapting its core model has limited its usefulness in the constantly evolving IT adoption context. Finally, the efforts to patch-up the TAM to address evolving IT contexts have not been based on solid and commonly accepted foundations, resulting in a state of theoretical confusion and chaos (Benbasat & Barki, 2007).Irrespective of the above concerns, a consensus exists that TAM provides a strong foundation on which to conduct research, which is why it is believed to be appropriate for the purpose of this research.

Despite the above limitations and critiques of the TAM, as a theoretical model based on previous theories, the TAM remains the most influential model that strives to predict and determine the acceptance or rejection of using technology with its core constructs, such as, PU and PE, and attitude (Chuttur, 2009). These main constructs have been validated by numerous studies (see Table 3.1) and their results show their ability to determine the level of acceptance.

3.3 IS MODELS SUMMARY

It can be seen from the literature review the models that were discussed have a number of advantages and disadvantages. Importantly, by considering the strengths and weaknesses associated with each model, a comparison can be drawn between them, thereby enabling a researcher to select the most suitable one in the context of the research being conducted. It is, however, apparent from the literature review that all the models only focus on specific theoretical problems with each concept having been tested and developed using a limited group of IS adoption guidelines (Benbasat & Barki, 2007). Importantly, owing to the fact that the utilisation of IS is becoming more complicated, particularly in the area of VLE technology, placing sole reliance on just one model may not prove to be successful. No model, to date, is considered capable of being completely applicable and successful in all circumstances.

3.4 CONCLUSION

Following the literature review of the IS models (the TRA, TPB and TAM) earlier in this chapter, the present research will use the TAM model as a tool to investigate the attitude of students toward using VLE systems, such as, Blackboard's Course Management System. In addition, decision-makers in the university should be informed to understand better the implications of investing in such technology. These implications include taking advantage of VLE tools for course delivery in order to enhance their traditional courses and attract older people who cannot attend classes in person to provide them with the opportunities to take degrees (Schroeder, 2003).

Owing to today's changes in education systems, educators need to take actions to ensure the availability of large numbers of knowledgeable practitioners skilled in adapting to this pace of change. Teachers, students, and curricula determine the quality of different kinds of education. In most schools, emphasis is always placed on curriculum development, the selection, and organisation of content, the organisation of teaching and student evaluation. Certain dimensions of the educators' role, such as, the ability to develop objectives, assess students' needs, and evaluate their performance are frequently discussed in the literature. One important aspect of the educators' role has traditionally received less attention, namely, their role in identifying the factors that should be considered in the selection of teaching, particularly learning strategies, students' learning preferences, styles and concerns (Callister *et al.*, 2000). Stutsky & Laschinger (1995) add that educators should be cognisant of their students' learning styles so as to design well-rounded curricula.

Rourke & Lysynchuck (2002) indicate that, recently, many researchers have come to accept learning styles as an important construct in education. This had led to numerous individual studies and subsequent meta-analyses, which have established a significant correlation between learning styles and learning outcomes. A learning style is generally described as an attribute or quality of an individual, which reflects a pattern of information-processing behaviours used to acquire knowledge or skills and to prepare for an anticipated test of memory (Kelly, 1997; Stutsky & Laschinger, 1995).

The importance of using the TAM model as a theoretical basis for specifying the causal relationship between two main beliefs, Perceived Usefulness and Perceived Ease of Use, the attitude and behavioural intention (BI), the problems of low adoption or underutilisation of technology should also be considered especially as this forms our research model (Davis, Bagozzi &Warshaw, 1989). This theoretical model, which includes the external variables selected for this research, combined with an understanding of the learning styles of the students the researcher believe will form a very strong research model to recognise the attitude and the intention of towards the use of VLE systems in Libyan universities.

4 LEARNING STYLES MODELS AND THEORIES

4.1 INTRODUCTION

The previous two chapters described and discussed the VLE and Technology Acceptance Models. This chapter aims to complete the literature reviewgermane to this study by presenting and discussing the experiential learning theory of Kolb's learning styles (LSI). By dividing the literature review into three parts it assisted the researcher to acquire a comprehensive understanding of the research domain.

In order to answer the research question that the attitude towards using a VLE system is dependent upon the students' preferred learning styles, the researcher will review the literature upon learning styles and compare different models in order to select a suitable one and subsequently apply it to the research's framework described in Chapter Five. This chapter will present and analyse the most common learning style models that are described by the literature. The claims made for these models are critically reviewed. The effectiveness and validity of these models are scrutinised, along with the pedagogical implications that they entail. The literature review explores the range of models that exist in the research and practice literature, as well as the theories and their applications associated with these models in terms of claims made by various authors. The pedagogical implications of the learning style models are analysed. In particular, research opportunities are identified that exist in terms of developing framework able to link the relationship between learning styles and technology use or acceptance of online learning systems.

The literature was reviewed, using a variety of sources, to examine seven commonly used learning style models including their related instruments and their implications for learning environments to produce an overall assessment. The chapter provides a summary of the models intended for comparison in order to focus on the selection of a model for this research. This model should be comprehensive and widely used in previous studies. It should, especially, be based on theory grounded in learning styles, through which can be determined the appropriate style in order to address this research's purpose.

4.2 OVERVIEW AND DEFINITION

It has been a long time since researchers first started to gain an understanding and to explore learning styles within populations in about last five decades. The literature presents many such studies (Galpin *et al*., 2007; Burgess &Hanshaw, 2005; Pillay &Jugoo, 2005; Chamillard &Sward, 2005; Prescod &Dong, 2006;Thomas *et al*., 2002; Zualkernan et al., 2006; Zywno, 2003; Deibel, 2005; Parkinson &Redmond, 2002; Abu-Mughli *et al*., 2005; Ghinea &Chen, 2006; Zhang &Lambert, 2008; French *et al*., 2007; Berings *et al*., 2008; Mykytyn *et al*., 2008; Lee &Li, 2008; Sandman &Sacramento, 2008; Czuchry &Yasin, 2008; Galvan, 2007; Boatman *et al*., 2008; Beadles & Lowery, 2007) that has been conducted to investigate learning styles in different fields. These studies helped the researcher to review the learning style models.

Several theoretical models have been proposed for exploring learning style preferences. Some of these models were designed (instruments developed) to be able to increase an understanding of students' learning styles. These models (see Table 4.1) include those introduced by Withkin *et al*. (1971), Riechmann &Grasha (1974), Kolb (1984), Dunn

&Dunn (1984), Jackson (2002), Gregorc (1982), Riding (1998), Felder &Silverman (1988), Myers &Briggs (1985), Vermunt (1996), and Fleming (2001)and each has specific characteristics and dimensions.

Table 4-1Theoretical Learning styles models

Theoretical model	Year	Author
Group Embedded Figures Test (GEFT)	1971	Witkin *et al.*
Grascha-Riechmann's Learning Styles Questionnaire	1974	Riechmann & Grasha
Honey & Mumford's Model (LSQ)	1982	Honey& Mumford
Gregorc's Mind Style Delineator (GSD)	1982	Gregorc
Kolb's Learning Style Inventory (LSI)	1984	Kolb
Dunn *et al.*'s Learning Styles Inventory	1985	Dunn, Dunn & Price
Felder-Silverman Inventory of Learning Styles (ILS)	1988	Felder & Silverman
Vermunt's Inventory of Learning Styles	1996	Vermunt
Fleming's VARK Model	2001	Fleming
Riding's Cognitive Style (CSA)	1998	Riding
Myers-Briggs Type Indicator (MBTI)	1985	Myers & Briggs
Jackson's Learning Styles Profiler (LSP)	2002	Jackson
Herrmann's Brain Dominance Instrument (HBDI)	1982	Hermann

Several diverse definitions and views have been presented during the last two decades regarding learning style concepts, for example, Lee *et al*. (2008) defines learning style in terms of how information is processed as well as how it is perceived. According to McCarthy (1996), there are numerous elements regarding how we react to information. He summarised learning styles as being defined by how information is perceived and processed by a learner. Correspondingly, Croker (2002) highlighted that learning is the acquisition of knowledge.

Including the above, there are many views on learning styles. According to NASSAP (1979, p.16), “Learning style is characterized as cognitive, affective and psychological behaviours that indicate how learners perceive, interact with and respond to the learning environment”. This definition focuses on the ‘tendency to adopt a particular strategy in learning’. Most students have a preferred learning style, although they may adapt to a different one according to the task. Accordingly, Pask (1976) refers to these learners as ‘versatile learners’.

In the traditional classroom environment, educators are no longer interested in the interaction between teaching methodologies and learner experiences (Beadles & Lowery, 2007).This has lead to a shift from cognitive styles to learning styles as learners respond to the learning environment. As highlighted by Riding &Cheema (1991) and Loo (2002), learning styles concern the way in which the learner interacts with stimuli in the learning context. The fundamental principle is that each individual learns in different ways. Individuals, therefore, perceive and process information using different approaches (Kolb, 1984).This means the contents of a particular course might be understood and perceived differently by different students. Another earlier definition by Valley (1997) defines learning style as, “The preference that an individual may have for processing information in a particular way when carrying out a learning activity.” (p.43). Matthews (1996) describes learning styles as, “Cognitive, affective and psychological indicators of the manner by which students perceive, interact with and respond to the learning environment” (p.249).

Over the last two decades, significant contributions have been made to learning style literature, which has been accompanied by progress in the understanding of this phenomenon. The term ‘learning style’ refers to the preferences that facilitate learning in some situations but not in others. Many factors influence learning styles, such as, gender, ethnicity and age (Shuler, 1999). Furthermore, social factors have also been studied for their influence on the development of learning styles (Stenberg, 1997). Learners, however, adapt to new learning stimuli in their own environment and figure out what to do in order to be successful in learning the information or subject matter.

A learning style is commonly described as an attribute or value of an individual that reflects a pattern of information-processing behaviours used to obtain knowledge or skills and prepare for an anticipated test of memory (Abu-Mughli*et al.*, 2005; tutsky&Laschinger, 1995). Meanwhile, Zhang &Lambert (2008) describe learning styles as influencing students’ ability to learn. They reported that no one style is considered to be better than another. Accordingly, Felder & Spurlin (2005) added that a strong learning style is the preferred way by which an individual takes in and processes information and so there is no good or bad learning style but people tend to prefer a certain single style over another.

Based on the above definitions, it can be seen that the importance of learning styles preference as a factor can play a significant role in understanding the attitudes of the student’s preferences to learn, attend and interact with education. This may provide the present research model combined with external factors assistance in evaluating the acceptance or rejection of technology amongst students using a VLE system. Thus, the researcher is interested in studying learning styles preferences that may contribute to a better understanding of student attitudes, their acceptance of the technology and if there is any subsequent impact on learning styles according to the researcher's prediction. As Rourke & Lysynchuck (2002) indicate, several researchers have recently considered learning styles to be an important construct in education, which can help educators to design suitably well-rounded curricula. This has led to numerous studies and subsequent meta-analyses, all of which have found significant correlations between learning styles and learning outcomes (Abu-Moghli *et al*., 2005).

For the purpose of this research, the study discusses the most popular learning style models. These models are Kolb's Experimental Model, Honey &Mumford's Learning Styles, Gregorc's Mind Styles Model, Dunn &Dunn's Model, Jackson's Learning Style, Riding's Cognitive Styles Model, and the Myers-Briggs Type Model.

Before that we recognise the selected learning styles models in the present research, the study would like to note and review what the contents of Coffield's *et al.,* (2004) report found, which may provide us with more in-depth concepts in the field of learning styles models. The present study considers Coffield's research is the main reference for purely being done in assessing the learning styles models selected in this research. The next section details the summery of Coffield's *et al.,* (2004) research.

4.2.1 COFFIELD *ET AL.*, (2004) SUMMERY IN LEARNING STYLES

Based on coffield's *et al.,* (2004) critical research of learning styles models, they raised many issues related to the importance of using learning styles preference to impeded on education system such as pedagogy strategies, designing modules suits students' preferred their learning styles, and enhance the tradition teaching methods by developing online teaching with involving learning styles.

These issues focuses for example, on the possibility of teach students with knowing how they learn, ‘How can we improve the performance of our employees if we do not know how we ourselves learn or how to enhance their learning?’, can we able to understand the learning difficulties of students in order to steer the learning strategies to overcome the problems facing students’ learning, and ‘what model of learning do we operate with and how do we use it to improve our practice and that of our students/staff/organisation? (coffield’s *et al.,* 2004, p.1)’.

These are some important issues raised by the researchers who involved in the learning and teaching field, the present research relied and benefit from the Coffield’s *et el* critical research in order to better understand, review, and select appropriate learning styles model to employed in the research model.
On this regard, coffield *et al.* (2004), have described learning styles as vital and there are strong appeal that teachers and course designers should focus and pay more attention to students’ learning styles by exploring their preferred learning styles and encourage learners to reflect on them.
The researchers argue that learners will become more motivated to learn when they able to know more about their strengths and weaknesses. In the same time, if instructors/teachers may respond to learners’ strengths and weaknesses, then retention and attainment rates in formal programmes are likely to rise.

Coffield *et al.* (2004) have discussed the learning styles from three different areas of activity as they considered learning styles field as unified, these area are theoretical, pedagogical, and commercial. The theoretical and empirical research area are still growing in most Europe include UK and US which began in the 20^{th} century and still developing a number of instruments. In their research they identified about 71 learning styles models from over the entire world, in this regard they only focused only on 13 models as significant and most recognised models to analyse and compare that models by using specific criteria.

The second area is an enormous body of research among teaching and learning where researchers are from various specialisms, mostly from assorted branches of psychology and some from sociology, business studies, and education.

Commercial industry is the third area that encouraging specialism to endorsing specific inventories and instruments. Some learning styles inventories have become extremely influential and popular; for example, the Dunn, Dunn (LSI) inventory has been widely used in US, while in the UK, both Kolb's (LSI) inventory and Honey and Mumford's learning styles questionnaire (LSQ) are extensively known and mostly use. In the commercial side the creator of the inventories relies on what they think is based on theoretical and empirical bases, therefore many teachers use the popular instruments in their experience with their acknowledgment of a clear idea of why they have chosen a particular model. However, often and more problematically, some inventories need to respond to rise deeper questions about whether a particular inventory has a sufficient theoretical bases at least to inform the users of this inventory in case of rely 100% of those models. Another serious aspect, that the creators invent their models and instruments for different purposes. where many of them aim to add theory on learning styles and do not design their instrument for use in mainstream practice, while others develop their instruments to be used by practitioners in various contexts. This may lead to confuse the models' users of selecting the different models and instruments due to those various purposes which designed for.

In their critical research Coffield's *et al.* (2004), have evaluated learning styles from three different areas of research by mostly focusing on theoretical background, empirical, and pedagogy implication. They reviewed the most popular models by selecting one or two from the family of learning styles as classified by Coffield *et al.*, (2004). Figure (4.1) shows the family of learning styles which was constructed by the classification of learning styles analyzed by previous scholars in the field of learning styles (Curry, 1991; Claxton and Ralston 1978; De Bello 1990; Riding and Cheema 1991; Bokoros, Goldstein and Sweeney 1992; Chevrier *et al.* 2000; Sternberg and Grigorenko 2001). Coffield *et al.*, (2004) have argued that some models believed by the authors came from the influence of genetics on fixed, inherited characters and about the interaction of personality and cognition. Where other models recognize external factors such as immediate environment, and styles should be changed and not fixed. In addition, other group of models classified based on the idea of dynamic interplay between self and experience. These models were created according to personal factors such as motivation, environmental factors (individual learning, impact of curriculum design), and organization culture and teaching style and assessment tasks.

Coffield et al., have identified five families of learning styles and they argue that this classification would assist them to analysing the differences among various learning styles models. These families are described as follow:

- constitutionally-based learning styles and preferences
- cognitive structure
- stable personality type

- 'flexibly stable' learning preferences
- Learning approaches and strategies.

The family identified by Coffield's *et al.,* research, which illustrate the theorists beliefs about designing and develop their models, below are the idea behind each family explained by the Coffield *et al.,* (2004).

1- Genetic and other constitutionally based factors

   This category is based on the beliefs that people born with many element-based character and astrologically determined characteristics linked with right or left-handedness this was accepted by in most cultures. This was considered by theorists of both cognitive and learning styles which they assumed that styles are fixed and may mostly difficult to change. they defend their beliefs by consider that individuals are genetically influenced personality traits, or to the dominance of certain functions associated with left or right halves of the brain, such these theorists for example, Dunn and Dunn.

2- Cognitive structure

   In this family theorists have shared opinion that learning styles as 'structure properties of the cognitive system itself' (Messick, 1984, p.60). Within this group they beliefs that styles are not just habits, with the changeability that this implies; instead of 'styles are more like generalised habits of thought, not simply the tendency towards specific acts … but rather the enduring structural basis for such behaviour' (Messick, 1984, p.61). These theorists consider the styles are associated to specific personality characteristics, with the inference that cognitive styles are rooted in personality structure. As example of these theorist are Ridings model of cognitive style.

3- Stable personality type

The learning style considered as one part of the apparent expression of relatively stable personality type by this family. This belief was based on the early work done by Jung (1968). The developers within this group focused on creating inventories which set in learning styles within an understanding of the personality characteristics that form all aspects of an individual's interaction with the world. Among these theorists are Jackson (2002) and Myers-Briggs type Indicator (MBTI).

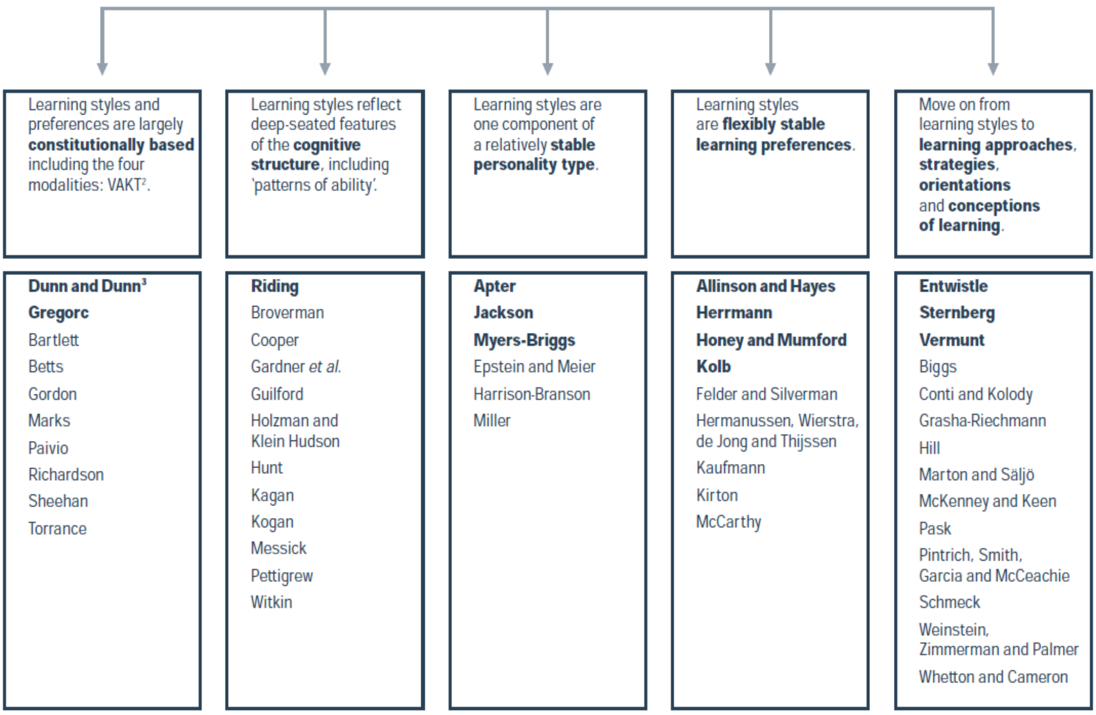
4- Flexibly stable learning preferences

Theorists of this family include the most influential models developed by Kolb in the early 1970s suggests that learning style is not a fixed attribute, rather a differential preference for learning, which could changes gradually from situation to another. At the same time Kolb (2000) explained that there is some long-term stability in learning style. As it said that learning style will remains bear a close similar within individual of his 60 age and when he was the age of 20. The most popular theorists of this family are Kolb (1980-2000) and Honey and Mumford (2000).

5- Learning approaches and strategies

One of the most known for this belief and work was led by Entwistle over 25 years ago, where a body of research explored active vision of approaches and strategies as contrasting to styles that considers the impacts of previous experiences and contextual influences. In this family the theorists beliefs that contextual factors influence learners' approaches and strategies and direct to a multifaceted view of teaching. This increase supports a broad approach to pedagogy that includes subject discipline, organisation culture, students' previous experience and curriculum have organised and assessed. Entwistle' model and Vermunt's model of learning are the most well-known developer among this group.

Figure (4.1) family of learning styles Coffield *et al*., (2004)



Coffield *et al*. believe that their classified families (continuum) based on creators and developers' of learning styles models/instruments variety of disciplines. They put some theorists on the left-hand as shown in Fig (4.1) with the string beliefs about the influence of genetics on fixed, and the inheritance of individuals' behaviours, while others such as Dunn and Dunn's model beliefs the impacts of external factors such as environment would affect on learning styles preference with no change. Moving towards right in the figure, by contrast there are models where based on the idea of dynamic interplay between self and experience. On the other right hand side, other theorist focused on personal factors such as motivation, environmental factors, and the impact of curriculum design, in addition to, 'institutional and course culture and teaching and assessment tasks on how students choose or avoid particular learning strategies' (p, 10).

From the above classified family, Coffield *et al.,* reviewed 13 models which they considered the most influential and potentially models. Their analysis was based on previous studies where researchers have evaluated the underlying theory of a model, and empirical studies of both reliability and validity and pedagogical impact. They follow suitable criteria for the analysis of the chosen models in order to ensure the comparability such criteria as origins and influence, description and scope of learning style instrument, reliability and validity, external evaluation, implications for pedagogy, and empirical evidence for pedagogical impact.

For the purpose of the present research, the researcher followed the review of Coffield *et al.,* research as the main source of literature with other important studies, in order to review only seven as most influential and used learning styles models. For the comparable of these models the researcher focus on the definition of the model, description of the theory based, instrument structure, and reliability and validity as the main focus of this study. The study not taken into account, the pedagogical impact of the models because not involved in the aim of this study. These models are Kolb's Experimental Model, Honey &Mumford's Learning Styles, Gregorc's Mind Styles Model, Dunn &Dunn's Model, Jackson's Learning Style, Riding's Cognitive Styles Model, and the Myers-Briggs Type Model. These different models will be discussed in the next section.

Before that we recognise the selected learning styles models in the present research, the study would like to note and review what the contents of Coffield's *et al.,* (2004) report found, which may provide us with more in-depth concepts in the field of learning styles models. The present study considers Coffield's research is the main reference for purely being done in assessing the learning styles models selected in this research. The next section details the summery of Coffield's *et al.,* (2004) research.

4.3 LEARNING STYLE MODELS

Several theoretical models have been proposed to explain learning style preferences and several instruments have been developed to identify them, including Kolb's Experimental Model, Honey &Mumford's Learning Styles, Gregorc's Mind Styles Model, Dunn &Dunn's Model, Jackson's Learning Style, Riding's Cognitive Styles Model and the Myers-Briggs Type Model. In this study, the researcher evaluated seven known learning style models, describing them in detail based upon the explanations of previous research and studies.

In order to ensure coherency and consistency, the researcher concentrates on what is considered to be important for the purpose of the study, and such criteria to finalise the suitable model. The analysis of these models comprises identifying the model and its theory, examining the instrument's structure, considering its reliability and validity and finally assessing it. As reliability and validity constitute one part of this study, these criteria should be the main ones used to select the model that can be applied to the present research. The ease of use of the model is considered to be important for ensuring that a suitable one is selected. Therefore, the following sub-sections describe each model in detail.

4.3.1 GREGORC'S MIND STYLES MODEL AND STYLE DELINEATOR

Gregorc (1982b) identifies two dimensions of learning styles: perception and ordering. Perception is defined by Gregorc as 'grasp of information' on a range between 'abstract and concrete', whilst ordering is defined as the way in which information is 'arranged', 'systematised' or 'referenced' on a continuum from 'random to sequential'. Gregorc's 'sequential processing' and 'random processing' also resemble Guildford's (1980) 'convergent thinking' and 'divergent thinking'.

According to Gregorc (1979), learning style is defined as the 'distinctive behaviours' by which a person learns and adapts to his/her environment. He proposes the Mind Styles Model, which states that minds interact with their environments through 'channels', and further proposes that these can be measured by the Gregorc Style Delineator (GSD) (1982). The four styles of learner are described as:

1. The concrete sequential (CS) learner: distinctive behaviours of being ordered, perfection-oriented, practical and thorough.
2. The abstract sequential (AS) learner: behaviours that tend to be logical, analytical, rational and evaluative.
3. The abstract random (AR) learner: characteristic behaviours of being sensitive, colourful, emotional and spontaneous.
4. The concrete random (CR) learner: distinctive behaviours of being intuitive, independent, impulsive and original.

These four channels act as mediate ways of receiving and expressing information. The conception of these four channels united with two axis to represent concrete against abstract and sequential against random ordering abilities. Every individual can utilise all four channels, however, as Gregorc's (2002) claim that due to God-giving to individual he can preferred and tend towards one or two of them. Also Gregorc contradict that individuals cannot change point arrangement during one's life (Coffield *et al*., 2004).

GSD Instrument (scale)

Gregorc (1982a) designed an instrument comprising of ten items self-report, each of which consists of four words that deal with the meaning of learning. Respondents rank orders those words from least descriptive to most descriptive. The words used in a questionnaire may not be understood by the respondents who are, therefore, expected to produce erroneous results (e.g. 'attuned' and 'referential'). The instrument includes a manual which provides descriptions of characteristics apparent when a particular style is dominant (Coffield *et al*. 2004). This publication does not report on any normative data or statistical trends based on studies using GSD.

Reliability and validity

Gregorc (1982) conducted a study using only a small sample size (n=110),the results of which show a high degree of reliability at more than 0.6 with internal consistency of the items correlated to each other (Gregorc, 1982b). Criticism, however, has been reported regarding its validity as there is no evidence to show construct validity. The assumption in Gregorc's study was that the ranking of words in each item characterises learning styles in GSD (see Table 4.2). Coffield et al. (2004) have discussed the reliability and validity of Gregorc' model and found that there are no independent studies of test-retest reliability, however, independent studies of internal consistency and factor analysis were found but it raises worries regarding the psychometric properties of the GSD. This was addressed by Joniak and Isaksen (1988) who found the alpha coefficients ranged between 0.23 to 0.66.

Table 4-2Pros and cons of the GSD model

	Strengths	Weaknesses
General	The GSD is based on two dimensions: perception and ordering.	Styles are innate abilities and cannot be changed over time.
Design of the model	These dimensions include a concrete abstract continuum and sequential randomness.	Words in the questionnaire are not clear or familiar to the participants. Normative data is reported, and detailed descriptions of the style characteristics are invalidated.
Reliability	The author reports high levels of internal consistency and test-retest reliability.	Reliability of GSD is questionable in terms of psychometric properties based on independent studies.
Validity	Correlations are reported to be moderate.	The empirical evidence is absent for construct validity.

Assessment

Overall, the conclusion is that the above scale is not an instrument based on a learning theory that can be used for the evaluation of individual learning styles.

Owing to the lack of evidence that supports the reliability and validity of GSD, as well as the fact that the basis for identifying learning styles is not supported by or rooted in theory, GSD is inappropriate for use in this research. It is not suitable for studying the intention to use the blackboard system under investigation. The literature, however, provides some support for the different groups as they relate to sequential and random constructs.

4.3.2 RIDING'S MODEL AND COGNITIVE STYLES ANALYSIS (CSA)

Cognitive style is defined as the manner of an individual's thinking and their preferred way of organising and structuring information (Riding &Rayner, 1998).

Riding &Rayner's (1998) proposed model is based on a number of concepts, such as, learning through experience, preference for modes of instruction and the development of cognitive skills and processes used by learners in learning activities (Coffield *et al.*, 2004). Thus, their model does not deal with an extract of different learning styles but rather focuses on the development of cognitive ones, learning through experience and social behaviour. Riding & Rayner's (1998) model depends on two dimensions. Importantly, the first dimension involves cognitive organisation, whilst the second one refers to mental representation. The mental representation dimension is designed to measure how fast an individual can process verbal and visual information. The measurement of both these dimensions is focused on speed rather than accuracy.

CSA Instrument (scale)

Riding's (1998a; 1998b) model was designed using a computerised assessment scale methodology, referred to as Cognitive Styles Analysis (CSA). It provides learners with cognitive tasks and measures two dimensions: 'holistic-analytical' and 'verbal-imagery'. The verbal-imagery aimed to measure a natural tendency to process information fast in the form of verbal or in visual. In this model, the comparative speed of matching responses is considered more important than the accuracy of the responses for both dimensions. Riding's model was theoretically based on Witkin (1972) on the field of dependence and independence, and verbal-imagery dimension was based on the work of Paivio's theory (1971). 'On the basis of two early studies, Riding thought that the verbal-imagery dimension was also related to introversion-extraversion, with introverts tending to be imagers and extraverts to be verbalisers' (Coffield et al., 2004, p.41). The CSA has been reported to be suitable for adults as well as young students (Riding, 1998b).

Reliability and Validity

Although Riding's studies reported on the validity of their model, there is no description in the literature that has been published by Riding regarding the reliability of CSA. Peterson *et al*. (2003a), however, conducted a study and used the CSA model. They reported that the results showed that reliability was very low for the verbal-imagery dimension with a correlation coefficient(r = 0.27) and low for the holistic-analytical dimension (r = 0.53). These results may be because their sample size was small (n = 50). Another study by Redmond *et al*. (2002) established a negative correlation for the verbal-imagery dimension (r = 0.21) and a positive correlation for the holistic-analytical dimension (r = 0.56). Thus, only a limited number of studies provide evidence of reliability even after a decade of research on CSA (see Table 4.3).

Table 4-3Pros and cons of the CSA model

	Strengths	**Weaknesses**
General	It emphasises that strategies for learning can be adopted and help improve learning.	The model assumes that learning styles cannot be changed.
Design of the model	The model describes two dimensions of learning: holistic-analytical and verbal-imagery.	It does not cover aspects of cognitive thinking or learning.
Reliability	(Not known from Riding's studies)	From other studies reported as very low (0.27); also there is a lack of empirical research to support the instrument.
Validity	Riding states that the measures may be more suitable for groups than for individuals	(Some studies reported no validity for the model because of small sample sizes, thus not enough to evaluate reliability and validity)

Assessment

Riding's model is simplistic, and its CSA instrument is unreliable. There are conceptual problems with Riding's model and the instrument. Notably, Riding's view of 'holistic' entails field-dependence, impulsiveness and unwillingness to engage in complex analysis. Analysis and synthesis have also been placed at opposite extremes as characteristics. He reports cognitive styles to be fixed and non-changeable but also to be seen as preferred and habitual processes.

There are empirical issues with Riding's model and CSA; however, it may have implications for pedagogy in that teaching directed at any of the poles described in the model would present limitations for the students. Thus, a teacher should teach in dual mode to address both generalities and specifics; structuring the teaching material in such a way that global and specific issues are addressed, using deductive and inductive reasoning and emphasising verbal and visual communications. Considering these limitations, the researcher cannot rely on this model for this study as it is not appropriate for measuring students' different learning styles and their impact on acceptance of technology.

4.3.3 DUNN & DUNN'S MODEL AND INSTRUMENTS OF LEARNING STYLES

The main advantage of Dunn &Dunn's model is that it has become accepted amongst elementary schools in the US since the 1960s. It is being used in teacher training courses and by individual practitioners (Dunn, 2003). Reese (2002) has stated that Dunn &Dunn's model has attracted financial support from the US government to be implementation school districts. Klein *et al*. (2003a; 2003b), however, have called for further research into the usefulness of the model before allocating resources for its use by school districts for enhancing the retention and achievement of students.

Dunn &Dunn’s model is based on five threads of motivation that influence an individual's learning. These threads are environmental, emotional, sociological, physiological and psychological. Environmental motivations are related to the external surroundings of the learner, such as, lighting, furniture, seating arrangement in the class and temperature. Emotional motivations are associated with attractiveness, encouragement, responsibility and structure. Sociological motivations have a limited connotation to do with the social dynamics of the student’s preference for learning alone, in peer groups, in teams or whether they are in the presence of an instructor who might be using assertive or mutually respectful approaches. The physiological threads evaluate senses, such as, visual, auditory, kinaesthetic or tactile and the need for eating food or drinking water whilst learning. The psychological stimuli are associated with information processing, such as, global and local or impulsive and reflective.

Dunn &Dunn (1992) place emphasis on biologically developed characteristics and define style to be the manner by which people process, reflect and retain information.

Instrument (scale)

Dunn &Dunn’s model instrument relies on assessing learning style preferences based on the five motivational threads described above, with the respondent trying to answer a questionnaire in terms of how desirable he/she found the categories described in the model. Previous researchers who have used this model have stated that it is easy to use and there is no ambiguity in understanding the words of the questionnaire.

A large number of research studies have been conducted within higher education institutions using Dunn &Dunn’s model (Lovelace, 2003). Several awards have been received by Saint John's University, which has conducted research into learning styles preferences and adopted the Dunn &Dunn model. This model has been used by various groups in higher education with different academic levels, such as, gifted, at risk, drop-outs, special needs and those in vocational disciplines.

Reliability and Validity

Numerous studies have been conducted that used this model extensively, including adapted versions (Dunn &Griggs, 2003). Many studies have used a set of demographic variables, such as, age, gender, socioeconomic status, academic achievement, race, religion, culture and nationality (Ewing &Young, 1992; Dunn *et al.*, 1995). The results have shown that these factors are important in influencing the learning preferences of students. Dunn & Dunn make a case for the reliability of the model by describing studies performed under various conditions, including strict administration of the model in authorised centres and by certified learning style trainers who randomly selected students to constitute a representative sample. The selection criterion, however, is not explained by the authors.

De Bello (1990), based on his studies of Dunn & Dunn's learning style instrument in use over two years at Ohio State University, reports a high degree of reliability and validity. Other authors (Hlawaty &Honigsfeld, 2002; Curry, 1990; Geiser &Pinto, 1991) have cited De Bello to support their claims concerning the efficacy of Dunn & Dunn's learning style instrument in comparison to nine other instruments (see Table 4.4).

Table 4-4Pros and cons of the DLS model

	Strengths	Weaknesses
General	Model is responsive in terms of various factors, such as, motivational, social, interactional, physiological and environmental.	It presents a simplistic view of physiological and psychological preferences.
Design of the model	Teachers adopt specific techniques or make environmental changes based on strong preferences.	It is criticised for not being a model for learning. There is no theoretical basis for the model.
Reliability	Strong claims are made by authors using LSI.	There is criticism of the design reliability of the model.
Validity	Strong claims made by supporting studies.	There are questions about the model's validity.

Assessment

There is a sizable amount of supporting literature relating to the use and benefits of the model generated over the years, despite the limitations of many of the studies. Dunn & Dunn (2003) suggest that when there is merging and matching between instructional environments and learning styles, students will be positively influenced by learning. Teaching students without knowing their learning style is still a significant issue and needs to be investigated with this model providing some instruction on the matter.This model is considered to be more popular than most and is heavily used in schools in the US,however, an independent examination of the model is still lacking. Thus, this model is not appropriate for this study as the target sample of this study is university students.

4.3.4 JACKSON'S LEARNING STYLES PROFILER (LSP)

Jackson (2002) invented the learning styles profile model (LSP), which relies on two theories: personality theory and psychobiological theory of both Gray's (1992) and Cloninger (1993). Four learning styles are proposed by Jackson's LSP (2002), namely, initiator style which linked to Gray's (1992) Behavioural Activation System (BAS), reasoner style liked to Gray's Behavioural Inhibition System (BIS), analyst style thought to be followed by Cloninger (1993) who consider the analyst style as self-regulatory which serves to maintain interest in a problem, and implementer style which treat problems by logical (Coffield *et al.*, 2004). They appear to be similar to Honey &Mumford's (2000) learning styles. Notably, Jackson does not relate his styles to stages in the learning cycle. This model has little coverage in the literature, despite its structure being easier and more reliable than some others for exploring learning style preferences (Siadaty and Taghiyareh, 2007).

Instrument

The LSP instrument comprises 80 items, 20 for each of the four styles. Participants using LSP are asked to select one of three options: 'yes', 'no', or 'cannot decide'. Jackson's (2002) manual on LSP describes the compiled results as profile characteristics and offers suggestions for improving deficient learning style characteristics. The results of LSP are tabulated as percentile scores along with explanations of the results.

Jackson's learning styles (2002) resemble the four learning styles of Honey &Mumford (2000). Jackson argues that the names chosen to describe the learning styles may be inappropriate for deciphering the constructs. The four learning styles, as per LSP, are:

- Initiator: represented by sensation-seeking, impulsive and extroverted individuals.
- Reasoner: demonstrates intellectual, rational, objective characteristics and with theory-based mindset.
- Analyst: exhibits introverted responsible, cautious, wise, methodological and insightful characteristics.

- Implementer: displays expedient, realistic and practical preferences.

Reliability and Validity

A study by Jackson (2002) used a large sample size, the results of which, according to the manual provided, describe the reliability for each of the styles as acceptable. The sample size was (n=1524), with the reported alphas ranging from 0.72 to 0.75. These are encouraging figures, since two later retest studies also report moderate reliability. The three studies resulted in high Cronbach'sAlphas and the internal consistency of the items for each of learning styles (see Table 4.5).

Table 4-5Pros and cons of the LSP

Source: Jackson (2002)

	Strengths	**Weaknesses**
General	The LSP has a theoretical base using a computerised format. Designed for business and education.	Long items, which result in confusing the participants.
Design of the model	It presents four learning styles: Initiator, Analyst, Reasoner, and Implementer.	The four learning style constructs are not clearly defined.
Reliability	The reliability is acceptable and satisfactory because re-tests of the study meet the requirements	One scale (Reasoner) had poor retest reliability
Validity	Validity was claimed by Jackson on the basis of a four-factor solution.	The poor scale for Reasoner needs to be modified.

Assessment

The model and the LSP have the potential for wider use in the education field and in organisations. Only a small number of research papers have been published in the arena since the first publication of LSP by Jackson. It is still a relatively new instrument; thus, research is not yet available on subjects relating to its reliability or validity.

Notably, the use of LSP, especially it's pedagogical and development aspectsneed to be researched.

4.3.5 HERRMANN BRAIN DOMINANCE INSTRUMENT (HBDI)

In 1982, Herrmann developed a model called the Whole Brain Model, which depended on the split brain research carried out by Sperry (1964). Herrmann (1982) recognised the electroencephalographic correlations of left- and right-side brain functions based on the earlier theory. He proposed four categories of preference or style and their characteristics based on association with different parts of the brain. These categories are described as follows (Herrmann, 1982):

- Theorists: (cerebral, left: the rational self): Theorists are said to find it difficult to accommodate the feeling self and the humanitarian style.
- Organisers (limbic, left: the safe-keeping self): Organisers are said to find it difficult to accommodate the experimental self and the innovatory style.
- Humanitarians (limbic, right: the feeling self): Humanitarians are said to find it difficult to accommodate the rational self and the theoretical style.
- Innovators (cerebral, right: the experimental self): Innovators are said to find it difficult to accommodate the safe-keeping self and the organising style.

Herrmann's model describes a grouping of preferences and explains that the left brain combination of quadrants A and B and the right brain combination of quadrants C and D are more harmonious than combinations of D and B or A and C. From this representation, it is concluded that conflicts may arise from diagonal quadrants.

Herrmann designed an instrument known as the HBDI with the use of 120 items to classify mental preferences or thinking styles. These styles are also regarded as learning styles. The 'whole brain' model is not based on biological determinism (Wilson

&Dennis, 2007).Herrmann (1989, p.32) is convinced that, “The way a person uses the specialised brain results from socialisation, parenting, teaching, life experiences and cultural influences far more than from genetic inheritance.”

Herrmann demanded that individuals or organisations should develop sufficient flexibility to respond instead of relying on their natural preferences in order to increase the level of value of their responses (Allinson &Hayes, 2000).

HBDI Instrument

The HBDI was designed using a 120question (items) online test. Each of these items represented the classification of mental preferences or thinking styles in order to determine which of the model’s four styles of thinking the dominant preference is. These styles are also termed learning styles.

The HBDI is a self-reporting instrument that provides participants with a categorisation of their thinking styles and is performance rated in the following areas:

- Handedness
- Strong and weak school subjects
- Work elements (e.g. administrative, innovative and teaching/training)
- Key descriptors (e.g. verbal, emotional, factual)
- Hobbies (e.g. fishing, photography, travel)
- Energy level (e.g. day person, night person)
- Motion sickness (frequency and connection with reading)
- Adjective pairs (forced choice: e.g. controlled/creative)
- Introversion/extroversion (nine-point scale)

- 20 questions (five-point scale: e.g. “I dislike things that are uncertain and unpredictable”).

Reliability and Validity

Although the Herrmann research group has published research and articles involving case studies, only one statistical study has been performed regarding reliability. This study used a small sample size (n = 78) but which nevertheless reported high reliability. No precise and independent research study has been carried out to establish the reliability of the instrument.

The proposed categories of thinking or learning styles in the Herrmann Whole Brain Model show construct validity. The HBDI has been widely used in the field of education and business. To date, not many independent studies have researched the reliability and validity of the instrument. There is also an absence of longitudinal studies of the instrument. Herrmann’s detailed accounts, however, describe feedback by individuals and groups that participated in HBDI. These accounts indicate high face validity (Bawaneh *et al.*, 2010).

There are structural similarities between Gregorc’s Mind Styles Model and the Herrmann Brain Dominance Instrument. Both have four categories by which they organise learning styles. One of the largest studies that has adopted Herrmann’s model is the study performed by Martine (2003), which describes various combinations of Herrmann’s quadrants in a large sample (3,400) in the UK. The results show that ‘harmonious’ combinations (A–B and C–D) are the most common profile patterns (62%), followed by the upper (A–D) and lower (B–C) pairings (31%)and then by the conflicting diagonal pairings (A–C and B–D), which occur in only 7% of cases. This study has revealed the reliability and validity of the instrument (see Table 4.6).

Table 4-6Pros and cons of the LSP

Source: Herrmann (1982, 1989)

	Strengths	Weaknesses
General	HBDI has evolved by research over the past 20 years. The model is similar to other learning style models, some of which are based on HBDI.	The four categories of the model are still under debate amongst researchers.
Design of the model	HBDI is based on a theoretical framework of brain research. It is based on patterns of behaviour instead of personality traits.	HBDI is a web based self-reporting instrument, which means that one could report a particular profile intentionally.
Reliability	HBDI has been extensively used in different settings and the analyses pertaining to it can be done by using a large sample.	The reliability has not been established through independent empirical research.
Validity	HBDI has internal face validity and construct validity.	Total validity has still not been reported by independent research.

Assessment

This model has not been used widely in education and training, despite the potential for its use. It does, however, focus on the development of both people and organisations.

Unlike other models that have categorised learning styles into four categories and two dimensions and provided a simplistic view, Herrmann's Whole Brain Model does not label individuals or organisations; rather, Herrmann positively encourages change and growth, whether for short-term adaptive purposes or for the longer term, on the basis of more mature values and attitudes. Positively and on the other hand, Herrmann's group has facilitated the model and HBDI with revisions based on empirical research. The instrument, however, needs improvement with a focus upon its use by participants who do not have business or corporate experience and responsibilities and are younger, less experienced and less educated (Wilson, 2007).

Regarding the statistics described by Wilson (2007), Herrmann's model (instrument) has acceptable value in terms of its psychometric properties; however, it lacks support from an independent empirical research study to establish its reliability and validity. The model has been followed by other popular ones and instruments, such as; LSI by Kolb and LSQ by Honey &Mumford. The potential of HBDI to improve the quality of teaching and learning has not yet been supported by independent empirical research studies. The HBDI does have support from its followers in education as well as in corporate businesses.

4.3.6 Honey & Mumford's Instrument (LSQ)

Honey & Mumford (1982) proposed their learning style model and its instrument (Learning Style Questionnaire—LSQ) by direct derivation from Kolb's theory, after using Kolb's LSI instrument (described in the next section) for a number of years to study managerial learning. Although they relied on Kolb's theory, they also stated that they produced their own Learning Styles Questionnaire (LSQ) because they found that Kolb's LSI has low face validity with managers. Honey & Mumford started by exploring various approaches to examining differences in learning preferences (Coffield *et al*., 2004). The main departure point for their proposed model was by asking people indirectly how they learn, whereas Kolb asked people directly. Importantly, Honey & Mumford provided a questionnaire that probed general behavioural tendencies. Their reasoning for which was that most people have never consciously considered how they really learn. Thus, the LSQ was an outcome of these studies. The LSQ has continued to develop since 1982 through various updated versions and written manuals and booklets (Honey & Mumford, 2006).

Whilst there is a similarity to Kolb's model, there are also some variations to be noted. First, they proposed the term 'reflector' for divergers (reflective observation), 'theorist' for assimilators (abstract conceptualisation), 'pragmatist' for convergers (concrete experience), and 'activist' for accommodators (active experimentation).Second, they assumed that people prefer different ways of learning depending upon the situation and their experience level. Thus, people move between the four modes of learning rather than being locked dominantly into one mode. Each of the learning styles could be essential or significant in particular learning circumstances but not in other situations. Importantly, they recognised various factors that influence an individual's learning besides learning style, such as, experience, learning opportunities, the environment of the learning, the influence of teachers or training providers, etc...(Duff &Duffy, 2002). According to Honey & Mumford (1992), learning style is defined as, "A description of the attitudes and behaviour, which determine an individual's preferred way of learning." (p.44)

They divided their model into four types of learning style preferences: activists, reflectors, theorists and pragmatists. Moreover, they postulated that people prefer different methods of learning depending upon the situation and their experience level; (see Figure 4.1).The brief description of the four types of learner styles is as follows:

- Reflectors: Prefer to learn from activities that allow them to watch, think and consider what has happened. These people like to use journals and brainstorming techniques. They need explanations and an analysis of lectures.

- Theorists: Prefer to think problems through step-by-step. They prefer lectures, analogies, systems, case studies, models and readings. Discussion with experts is normally not helpful.
- Pragmatists: Prefer real practice and like laboratories, fieldwork and observations. They like feedback, coaching and obvious links between the task-on-hand and a problem.
- Activists: Prefer the challenges of new experiences, involvement with others, assimilations and role-playing. They like anything new, problem solving and small group discussions.

They stressed that each of the four learning styles have particular advantages over each other and any of the four learning styles could be essential in one particular set of circumstances but not in others. They further explored the various factors known to influence an individual's learning style, including experience, learning opportunities, the environment in which learning takes place and the influence of teachers.

Figure 4-1Learning dimension cycle

Source: Honey & Mumford (2000)

LSQ Instrument

The design of the LSQ instrument provides simplistic use since the items comprise questions that only need an affirmative or negative answer. Honey & Mumford (2000) presented two versions of LSQ: one containing 80 items and the other 40 items. The advantages of both versions are discussed below:

1. Advantages of the 80item instrument are:
   - It is perfect for participants who want a more comprehensive questionnaire, which consists of 20 items per style.
   - It is ideal for longer sessions where there is enough time to explore learning styles in depth.
   - It is more suitable for people who are in a business environment.
2. Advantages of the 40item instrument are:
   - It is suitable for new and inexperienced participants who have not given much thought to how they learn.
   - It is ideal if time is short, as it takes less time to complete the instrument.
   - It is helpful for staying focused.

Reliability and Validity

A study conducted by Honey & Mumford (2000) revealed the reliability of the instrument as a test and retest study was conducted comprising of 50 participants. The study described a correlation of r = 0.89 between the two tests conducted over two weeks. They claimed face validity for LSQ. Honey (2002) reports the results of a study conducted with a sample of 300 managers, stating that the reliability and validity of the instrument is acceptable. A MORI survey commissioned by The Campaign for Learning in 1999 revealed the validity of the instrument, subsequently highlighting that the

Honey & Mumford LSQ is considered to be the most widely used system for assessing preferred learning styles in the local government sector in the UK. The following table (Table 4.7) briefly describes the instrument's reliability and its other aspects.

Table 4-7Pros and cons of the LSQ model

	Strengths	Weaknesses
General	LSQ is based on theory and has the ability to explore attitudes and behaviours, which are the grounded for investigating learning styles. LSQ is used for personal and organisational development. It measures how people learn instead of being a psychometric measuring instrument.	When measuring, LSQ gives more than one learning style preference. It is inappropriate for assessment or selection.
Design of the model	Grounded by Kolb's theory model. Identifies four different learning styles and is based on a learning cycle.	Researchers criticize the model based on variance between learning style and personality.
Reliability	It has strong reliability according to various researchers.	Internal consistency has been found insufficient
Validity	The authors have claimed face validity.	LSQ confirmed lack of empirical evidence of validity. Thus studies are required to establish the validity and acceptance of the instrument.

Assessment

As mentioned by the MORI survey commissioned by The Campaign for learning (2007), the LSQ appears to be the most widely used model for assessing preferred learning styles in local government in the UK. In addition, many researchers mention that it is a widely used instrument in industry, education and various training environments, although the weaknesses of the model need to be addressed. Furthermore, according to the authors of the LSQ, there are two main uses for the instrument: firstly, it assists in developing plans for personal development and secondly, it demonstrates different learning styles to managers, thereby aiding them when selecting training activities for staff. Moreover, it is stated, “The LSQ has been widely applied in the fields of management training and education, [but] limited evidence exists concerning the psychometric properties of the LSQ.” (Duff &Duffy, 2002, p.1)

4.3.7 KOLB LEARNING STYLE MODEL (LSI)

Many assessments have been developed to identify learning style preferences for each perspective of a learning style (personality traits, information processing, social interaction and instructional preference). The most frequently used tool, according to the health, social science and allied literature is the Kolb Learning Style Inventory (LSI) (Hauer *et al.,* 2005; Katz, 1990; Katz &Heimann, 1991; Miller *et al*., 2005; Sandmire *et al*., 2000; Titiloye &Scott, 2001; Wessel *et al*., 1999).Kolb (1984) said, “Learning is the process whereby knowledge is created through the transformation of experience.” (Kolb, 1984, p.41)

Kolb (1984) described learning theory and LSI in his book when he said, “Experiential Learning: Experience as the source of learning and development.” LSI provides an extensive explanation of learning theory and how it is used in various fields, how the instrument works and measures individuals’ learning. Kolb’s research on learning theory has been extensively used in various fields, such a, education, computing, health science, management, law, medicine and nursing psychology (Kolb, 2000). The LSI has been translated into many languages and its acceptance reported widely.

Kolb developed a model of experiential learning and a learning style inventory based on a preferred learning mode, such that, reliance on a particular mode of learning results in a certain style (Loo, 2002). Moreover, Kolb believes that learning depends on six different assumptions: (a) Learning is best conceived as a process, not an outcome; (b) learning is grounded in experience; (c) learning, as a process, needs the individual to resolve conflicts between dialectically opposed demands; (d) learning is holistic, integrating the total function of the organism including thinking, feeling, perceiving and behaving; (e) learning requires interaction between the individual and the environment; and (f) learning, as a process, results in the creation of knowledge (Kolb 1984, pp. 26–38). Kolb's LSI incorporates the principles of experiential learning theory. Kolb (1984) explains, "Knowledge is continuously derived from and tested out in the experiences of the learner." (p.27)

In his work on experiential learning, Kolb proposed that learning is a tension and conflict-filled process in which new experience, knowledge, skills or attitudes are achieved through confrontation amongst the four experiential learning phases or modes (Kolb, 1984). For further explanation, see Figure(4.2).

1) Concrete Experience (CE): Individuals with strength in this mode tend to be more involved in experiences and deal with immediate human situations in a personal way (Kolb, 1984). Individuals with CE, as their learning style, prefer feeling to thinking and show stronger orientation towards enjoyment and relating well with others. Individuals with this learning style enjoy uniqueness and complexity instead of theories and generalities. They also prefer being involved with others in real situations where an open-minded approach serves the situation best. They adopt an intuitive approach rather than a systematic or scientific approach to tackle and solve problems (Sims &Sims, 2006).

2) Reflective Observation (RO): Individuals with this mode tend to understand the meaning of ideas and situations during observations and try to describe them

(Kolb, 1984). These individuals prefer understanding to practical application and are good at intuitively knowing the meaning of situations and ideas and their implications. RO individuals have an ability to look at things and situations from different angles and often reflect on an experience before giving a response (Sims &Sims, 2006; Kolb, 1984).

3) Abstract Conceptualisation (AC): Individuals in this mode are the opposite of those with a CE focus and deal more with logic, concepts and ideas. Individuals with this learning style are more inclined to think than to feel, to deal with situations logically and rely on their own ideas rather than through interactions with others. AC individuals also prefer general theories to intuitive understanding, managing problems by their ability to manipulate abstract symbols and concepts as well as using qualitative analysis to support their understanding of situations (Kolb, 1984).

4) Active Experimentation (AE): Individuals in this mode are somewhat contrary to RO individuals in that they are more focused on influencing people and changing a situation. AE individuals favour practical application over reflective understanding. Individuals with this learning style are able to get things done and are keen to take risks in order to achieve their goals. In addition, they have the ability to influence the environment around them and they prefer to see the results and to test the theories before using them as a base for decision making (Kolb, 1984).

LSI Instrument

Several versions of the LSI instrument have been developed over the years, specifically 1976, 1985, 1999, and 2005. The last updated version addressed some issues that had been the subject of criticism by many researchers, such as, the problem of its psychometric properties. The 2005 version presents choices to rank proffered learning modes where participants are asked to rank their preferences as 1, 2, 3, and 4, where 4 is the most and 1 is the least preferred ranking. The instrument consists of 12 statements with four possible endings (Kolb, 2005).

The LSI instrument attempts to measure individual perception over a range between the extremes of concrete experience and abstract conceptualisation, identifying individuals at one end who prefer a tangible or concrete involvement as against those at the other end who are more detached from the issue and prefer a more analytical approach (Brockbank &McGill, 1998; Sharp, 1997). In addition, the LSI measures how information is processed by individuals, by placing them between the two extremes of active experimentation and reflective observation (Lu *et al.*,2007). From the intersections of the dimensions or modes, four basic quadrants emerge that represent the four basic learning styles: diverger, assimilator, converger, and accommodator (Kolb, 1984, 2000) (see Table 4.8).

1) Divergers are subjects who come between concrete experience (CE) and reflective observation (RO) in the first quadrant on the right-hand side (see Figure 4.2).

2) Assimilators are subjects who combine reflective observation (RO) and abstract conceptualisation (AC) in the second quadrant on the right hand side (see Figure 4.2).

3) Convergers are subjects coming between abstract conceptualisation (AC) and active experimentation (AE) in the third quadrant, moving clockwise (see Figure 4.2).

4) Accommodators are subjects who come between active experimentation (AE) and concrete experience (CE) in the fourth quadrant on the left-hand side (see Figure 4.2). (Kolb, 2000).

Although a number of variants of experiential learning theory have been proposed, Kolb's (1984) Experiential Learning Theory (ELT) continues to be one of the most influential theories of management learning and serves as the basis of this research (Kayes, 2002; Li *et al*, 2008). More than 1,500 studies, refereed articles, dissertations and papers have been written on Kolb's work since 1971 (Kolb &Kolb, 2002), all of which provide insight into a broad range of management learning processes.

Kolb's (2000, 2002) model offers a coherent framework for determining an individual's unique learning style, such as, through understanding their own learning styles and how best to adapt them, which enables individuals to strengthen those areas of learning in which they are weak. They can make decisions about work and life situations that complement their learning styles.

Table 4-8Four learning styles: phase descriptions

Source: Tennant (1997), Kolb (2005)

Learning Style	Learning Characteristic	Description
Converger	Abstract conceptualisation plus active experimentation	• strong in practical application of ideas • can focus on hypo-deductive reasoning on specific problems • unemotional • has narrow interests
Diverger	Concrete experience plus reflective observation	• strong in imaginative ability • good at generating ideas and seeing things from different perspectives • interested in people • broad cultural interests
Assimilator	Abstract conceptualisation plus reflective observation	• strong ability to create theoretical models • excels in inductive reasoning • concerned with abstract concepts rather than people
Accommodator	Concrete experience plus active experimentation	• greatest strength is doing things • more of a risk taker • performs well when required to react to immediate circumstances • solves problems intuitively

Figure 4-2Learning style cycle

Source: Kolb (1993)

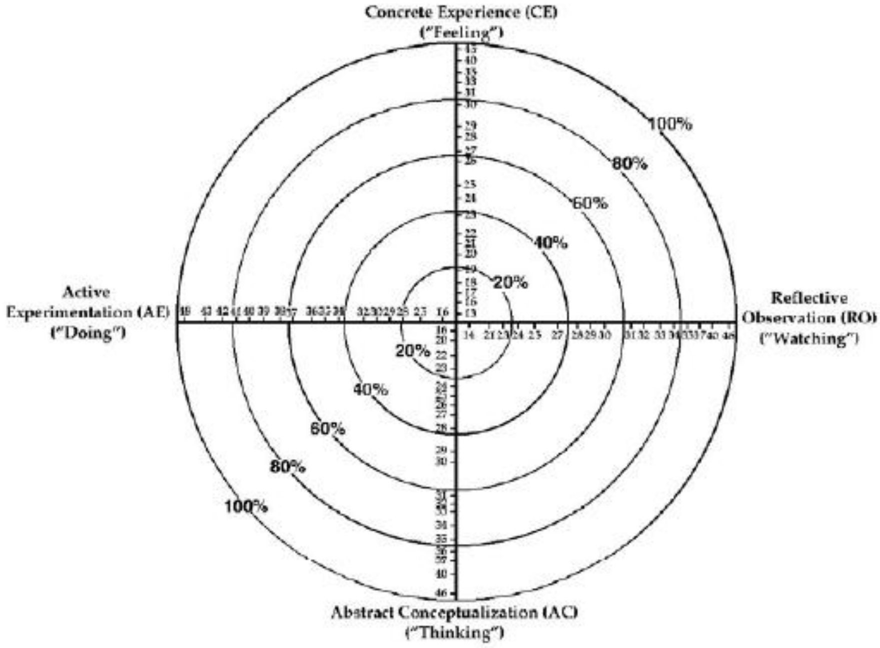
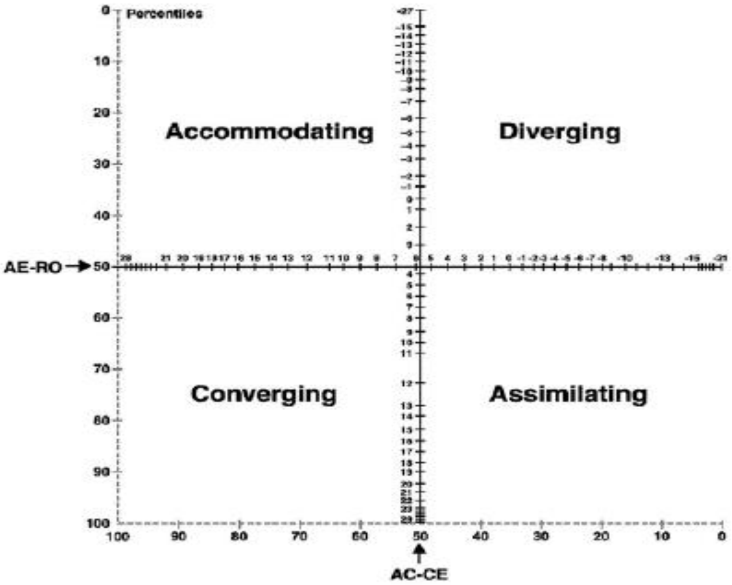


Figure 4-3Learning Styles Type Grid

Source: Kolb (1993)



Reliability and Validity

Since the first version of LSI was presented, many researchers have criticised its psychometric properties. For example, Freeman & Stumph (1981) criticised the reliability of testing and retesting. In addition, Smith (2001) addressed the psychometric problem, although Kolb claimed that the reliability coefficients for the two combined scores AC–CE and AE–RO were reasonable but admitted that those for the four basic scales were, “Somewhat less satisfactory.” He subsequently recommended, “Researchers should rely on the combination scores AC-CE and AE-RO and use the single scales” (Kolb 1981, p.293).

Freeman & Stumph (1981) argued that learning styles were not constant after a short time in the same workplace and thus reported low reliability. In contrast, after reviewing the LSI, Kolb (2002) claims that learning styles becomes stable over time, explaining that career engineers have converging learning styles but engineers with managerial responsibilities become more concrete because of their interpersonal job demands. Kolb (2005), in his latest research, attempts to address many of the issues regarding LSI reliability and has accordingly reported that the reliability is acceptable. Kolb (2000) has also addressed the validity of LSI. Other researchers, such as, Freeman & Stumph (1981), have reported the face validity of LSI(see Table 4.9).

Table 4-9Pros and cons of the LSI model

	Strengths	Weaknesses
General	The model and the LSI instrument have evolved with stability over years of research. Generally the LSI is easy to use and is understandable.	Some empirical research has demonstrated change.
Design of the model	Grounded by the experiential theory of learning. Based on experience leading to changes in the development of learning styles.	LSI mixes learning cycle, level and learning styles to confuse the position of the preferred style.
Reliability	LSI has been improved and changed over time.	Reliability is still criticised.
Validity	In the 2005 version the author has reported validity.	LSI has been developed to support self-assessment. The construct validity is still questionable.

Assessment

Research into learning styles based on experiential learning theory has shown deficiencies in reliability and validity. The evidence that relates to experiential learning and the Learning Style Inventory has been presented by Kolb *et al*. (2002). Two important studies, for example, Hickox (1991) and Iliff (1994) based their analysis on two main research projects. Hickox (1991), for instance, reported that experiential learning theory received full support from 61.7% of those surveyed, mixed support from 16.1% and no support from 22.2%. Iliff (1994) evaluated 101 studies and found that 48.5% supported the LSI, 39.6% demonstrated mixed support, whilst the rest did not support it. Moreover, Iliff (1994) has argued that LSI's purpose is for self-assessment.

Garner (2000) found that Kolb's work showed theoretical incongruity based on flexible learning styles. Essentially, he is not convinced about the influence of the environment upon learning styles and finds that Kolb's work entails a deep theoretical contradiction when he said, "How can it be described or measured?" (p.343).

According to Kolb &Kolb (2005), learning is most effective when learners go through the four stages of the learning cycle. Moreover, learning could begin at any of the four stages of the learning cycle; however, researchers who adopt it insist that it should be undertaken in sequence.

In addition, while Kolb's learning theory is not the only experiential model to use for recognising learning styles, it nevertheless provides one of only a few models that remain both comprehensive and fully generalised. In this regard, Kolb's theory is formally and explicitly stated and has generated an extensive body of empirical research and theoretical attention (Kayes, 2002). Moreover, its determined and comprehensive nature might add to its broad appeal in management learning. Since Kolb first developed the theory in the late 1960s, ELT has influenced a diverse range of management and education topics, including person-job interaction (Sims, 1983), research and development teams (Carlesson, Keane &Martin, 1976), organisational systems (Dixon, 1994), strategy development (Van der Heijden, 1996), design of management education (Lengnick-Hall &Sanders, 1997)and job counselling (Hunt, 1987).

4.4 COMPARISON OF THE LEARNING STYLES MODELS FOR THE PURPOSE OF SELECTING A RESEARCH MODEL

The previous sections have reviewed the seven learning style models in terms of their definition and structure. The review has afforded an insight into the instruments, explained their reliability and validity and finally assessed each of them in the form of a summary. This section will therefore present the groundwork for the selection of a research model by drawing a brief comparison, starting with the first model described in the previous section. The researcher has adopted similar criteria and subsequently added other ones, such as, most used within education, online usage and wide use of the model in the literature and relevance to the present research.

Gregorc created his model with respect to the association between learners' styles and teaching methods and their styles. He stated that when teachers understand teaching styles and that of their learners, students can then benefit (Gregorc, 2002). Based on his explanation, teachers should not change their natural styles, as that could do more harm than good. Given that Gregorc's model deals mainly with the idea of teaching and learning styles, this model is considered unsuitable for this research. This is because this research is concerned only with the learning styles of students. In addition, there is a lack of published research regarding the relationship between learning styles and technology usage. Moreover, little research has been done relating to education use.

The problem with Riding's CSA model lies in the weakness of its reliability with most studies calling for replication to establish its validity. Furthermore, no empirical evidence supports the model nor its instrument and no studies so far have used this model to impact on learning styles and the usage of technology.

For Dunn & Dunn's model, there is little evidence of independent research that evaluates LSI, although many researchers have used the model and described its impact and importance explicitly in terms of learning styles. The studies however, have raised concerns surrounding the instrument and have also criticised the LSI model for focusing on preferences rather than strengths.

Jackson's LSP model is a newcomer amongst the well-known instruments, which are widely used by researchers. This model needs to be tested by a greater number of independent researchers. The instrument has been designed to be easy to use, easy to understand and to offer fewer statements for consideration. It has a wide range of use amongst learners, teachers and managers.

Herrmann's model focused only on the work environment (externally and internally) with some studies describing this model as being useful only for training purposes owing to its ability to inspire creative thinking and problem-solving in the work environment. Thus, it is not a popular model amongst the education community and is, therefore, not greatly used by students. A recommendation is made that more research and investigation needs to be done on the use of this instrument in education.

Honey & Mumford's LSQ is the most popular model in the UK and the US in terms of use. The model is based on learning cycles, which gives the model more strength by providing insights to learners for improving their weaknesses by adopting strategies that would help them to enhance their learning. The design of the model also offers an explanation of learning-based cycles. The instrument has been used extensively for measuring learning styles in many areas of education, such as, colleges, universities and other learning environments.

The researcher found it difficult to compare the two models of Kolb and Honey &Mumford owing to their similarity in terms of theory, cycles and the environment in which they can be used. The researcher reviewed the models extensively, subsequently establishing that both models would be suitable for this research. The decision to select Kolb's learning styles model was made on the grounds that a wide range of previous studies have been done to determine learning styles in relation to a web-based learning environment and the international popularity of Kolb's as a reliable model that is more valid than Honey's & Mumford. The Kolb model is replicated with the aim of continued use; however, a criticism has been presented regarding the reliability and face validity of the model and about its psychometric properties bya majority of previous studies. Kolb has attempted to deal with these problems in recent years (Platsidou &Metallidou, 2009). The LSI is based on an experiential learning model described by Kolb (1999), as the learner's experience transformed into concepts and his/her new experiences are directed by previous ones According to Kolb, the learning experience is directed by the four stages of the learning cycle. This interesting concept was one of the reasons that led to selection of this model as it relates closely to the new experiences of using technology in the student's education and its impacts on their preferred learning styles. The researcher has, therefore, decided to choose this widely and extensively used model for this research, partly because it is the model most commonly used for education purposes, in addition to the suitability of this model for the present inquiry.

Based on the literature review, Table (4.10) shows the criteria and differences upon which the selection of a suitable learning styles model is based to be merged with the Technology Acceptance Model (TAM) to produce a more obviously clear picture of the relationships between students' preferred learning styles and their impact on the TAM model, for accepting or rejecting new technology, such as, VLE.

Table 4-10Comparison of learning style models

Learning Style	Reliability	Validity	Theory Based	Assessment	Most Used	Education used	Web-based used	Relevant research
Gregorc (GSD)	▲	▲	–	▲	–	–	–	–
Riding (CSA)	▲	▲	–	▲	–	–	–	–
Dunn & Dunn	▲▲	▲	▲	▲	▲▲	▲	–	▲
Jackson (LSP)	▲	▲	▲	▲	–	–	–	–
Herrmann (HBDI)	▲▲	▲	▲	▲▲	▲	▲	–	–
Honey & Mumford (LSQ)	▲▲	▲	▲	▲▲▲	▲▲	▲▲	▲	▲▲
Kolb (LSI)	▲▲	▲▲	▲	▲▲▲	▲▲▲	▲▲▲	▲▲	▲▲

Key:
▲ Weak
▲▲ Average
▲▲▲ Strong
– No

There is no doubt that individuals take up information and learn in different ways, however, at this stage, there is a lack of convergence on a unified theory as to how students learn. Almost all learning style research generally attempts to provide descriptions of students' preferred ways of learning. Park (2005) describes learning styles in terms of general characteristics showing individual differences in intrinsic methods of processing information. These intrinsic methods lead, as stated by Felder & Spurlin, to individualised strengths and preferences as to how students absorb and process information (Felder & Spurlin, 2005). There is no correct learning style (Howard *et al.*, 1996) but is important to be able to assess the learning style of a student. In fact, it has been stated that the most important application of learning styles is the design of effective instruction (Felder & Spurlin, 2005).

Whilst Kolb's learning theory is not the only experiential model to use for recognising learning styles, it does nevertheless provide one of the few models that remain both comprehensive and fully generalised. Kolb's theory is formally and explicitly stated and has generated an extensive body of empirical research and theoretical attention (Kayes, 2002). Moreover, its determined and comprehensive nature may add to its broad appeal in management learning. Since Kolb first developed the theory in the late 1960s, the Experiential Learning Model (ELT) has influenced a diverse range of management and education topics, including person-job interaction (Sims, 1983), research and development teams (Carlsson *et al.*, 1976), organisational systems (Dixon, 1994), strategy development (Van der Heijden, 1996), the design of management education (Lengnick-Hall &Sanders, 1997) and job counselling (Hunt, 1987). Miettinen (1998) suggests a reason for this influence when he said, "ELT combines spontaneity, feelings and deep individual insights with the possibility of rational thought and reflection. It maintains the humanistic belief in every individual's capacity to grow and learn, so important for the concept of lifelong learning. It includes a positive ideology that is evidently important for adult education." (p. 170)

As an integrative theory, ELT rests on a diverse set of theoretical traditions, including Dewey's Pragmatism, Lewin's Social Psychology, Piaget's Cognitive Development, Rogers's Client-Centred Therapy, Maslow's Humanism and Perls'sGestalt Therapy (Kolb, 1984, p. 15). In this regard, Kolb's theory spans the lifecycle of human development from young childhood to adulthood and encompasses activities, such as, career choice, education, problem solving and interpersonal relationships.

The Learning Style Inventory (LSI) has been historically critiqued. The main criticism has been about its psychometric properties, although LSI is a commonly employed measure of learning styles. Historically, Kolb’s Experiential Learning Model (ELM) has been considered one of the more popular theoretical models of learning styles. As noted in the previous section, the model depends on a cyclical process involving four modes: concrete experience (CE); reflective observation (RO); abstract conceptualisation (AC); and active experimentation (AE). After the experience of applying his theory in practice, Kolb (1976, 1985) developed the LSI as a tool for measuring learning styles. It enabled a learner to identify his/her style as one of the four dominant ones noted above. The LSI is one of the more commonly used instruments in this area and has continued to be employed during recent years (Loo, 2004; Yuen &Lee, 1994). Table 4.11 shows how previous literature has used Kolb’s LSI to examine relationships with other factors.

Table 4-11Previous studies using the LSI model

Factors	Authors
Age	Kolb 1971, 1976
Gender	Kolb 1976
Education level	Kolb 1971, 1976
Undergraduate major subject	Kolb 1974, 1976
Creativity	Kolb 1976
Personality	Kolb 1976
Occupation	Kolb 1976
Career	Kolb & Fry, 1974; Plovnick, 1975; Sadler, Plocnick & Snope, 1978; Wunderlich & Gjerde, 1978;
Career-choice influences	Plovnick, 1975; Wunderlich 1978
Approach to management education	Kolb, 1974
Creating and maintaining an effective learning organisation	Kolb, Rubin & McIntyre, 1971
Communication in an organisation	Kolb 1974
Preference for a particular instructional method or learning situation	Kolb, 1976; Sadler, Plovnick & Snope, 1978; Whitney & Caplan, 1978.

4.5 LIMITATIONS OF THE MODEL

According to Kolb (1985), with its more recent revision, the LSI has enjoyed a relatively long term of use, however, the LSI, as mentioned above, has also been severely criticised regarding its psychometric properties. The LSI has been criticised by several previous studies, many of which have focused particularly on the first version of LSI. The first version of LSI was presented formally in 1976 by Kolb and was revised and updated in 1985 owing to the criticisms and questions over certain issues of reliability and validity. The original LSI (1976) comprised nine items with four words representing four experiential styles. The respondents chose their preferences by ranking them in order in each row corresponding to Kolb's learning styles as described earlier. This version was subjected to psychometric criticisms because of poor score reliability (see, for example, Wilson, 1986; Willcoxson &Prosser, 1996; Veres *et al*., 1991; Swailes &Senior, 2001). In response to these criticisms of the first version, Kolb (1985) revised the format and scoring of the instrument by adding twelve rows with four sentences related to the four learning styles. The respondents could now rank their choices of the four sentences in each row, ranging from 1–4. Each column represents a single experiential style (CE, RO, AE, AC), which lead some to suggest that there is a risk of response-set bias, as described by Atkinson (1989), Ruble &Stout (1991) and Veres *et al*. (1987).

Moreover, aside from the evidence of face validity and frequency of use, both the 1976 and 1985 versions of LSI have been criticised in terms of the validity and reliability of their scores. For instance, previous studies have found many psychometric problems,such as, the use of ipsative scoring (Merrit &Marshal, 1984), factor structure issues (Penger *et al*., 2008; Geiger *et al*., 1993), response-set bias (Ruble &Stout, 1994) and reliability and validity (Atkinson, 1991). Owing to the time constraints of the current research the researcher has decided only to outline the problems established by the previous studies as opposed to explaining in detail the above issues raised as criticisms of the LSI model. Despite the criticisms that have been levelled at Kolb's LSI model, the researcher chose this model as a tool for studying the effectiveness of learning styles on the usage of the Blackboard Management System owing to the advantages that have been found with the LSI model, namely, its widespread use, the suitability of the model in the educational context and the fact that it is the most reliable and valid model.

As described earlier, there are several different learning style models, including those of Kolb (1984), Honey & Mumford (1982), Felder &Silverman (1988) and others. Each proposes different descriptions and classifications of learning styles. In the current research, the author focuses on Kolb's learning style model, entitled the Learning Style Inventory (LSI). Most other learning style models categorise learners into several groups, whereas Kolb describes the learning style of a learner in more detail, distinguishing between four dimensions of preference that are obvious, easy and can be used in any application. Another main difference is that LSI is based on tendencies, indicating that learners with a high preference for certain behaviours can also sometimes act differently (Platsidou& Metallidou, 2009).

LSI is used in many studies and researches related to learning styles in advanced learning. According to Carr & Ponton (2003), the Kolb model is suitable for any educational purpose and can be used for web-based learning. Learning styles are associated with student success in distance education courses. A study conducted by Gee (1990) suggests that successful distance education students favoured an independent learning environment. The Kolb Learning Style Inventory, which is often used in distance education learning research, was used to identify predictors of high risk amongst community college students taking classes via a Tele-course (Dille &Mezack, 1991). Moreover, Kuljis &Liu (2005) confirm this by conducting a comparison of learning style models with respect to applications in e- and web-based learning systems. As a result, they suggest that LSI is the most appropriate model. With the new version of Kolb's (2000) model, another reason for its utilisation is that the model offers a coherent framework for determining an individual's unique learning style. This means that by understanding their own learning style and how best to adapt it, learners can strengthen areas of learning in which they are weak. They can make decisions about work and life situations that complement their learning styles (Kolb, 2000). Our study relies on Kolb's LSI inventory model to assess learning styles owing to the fact that, from our point of view, this inventory provides a valuable measure of learning styles owing to the fact that it assesses directly how students prefer to learn, rather than predicting indirectly their strengths through a personality assessment (Alice &Kolb, 2005).

This particular inventory was selected for other important reasons. Firstly, the questionnaire was applied to various applications and different specialisations, such as, education, law, science, business and psychology in universities throughout the world. Secondly, it is simple to use and interpret. Thirdly, it provides good validation results (Kayes, 2005; Zhang &Lambert, 2008; French *et al*., 2007; Atherton, 2002; Abu-Moghli *et al*., 2005; Cook, 2005; Hauer *et al*., 2005).

4.6 LEARNING STYLE AND ONLINE EDUCATION

Previous research has investigated the effect of environmental conditions on learning styles. It has been assumed that learning styles could exert significant influence on many of the choices that students make. Some of this research has examined whether variations in variables, such as, academic performance and interests (e.g. choice of major) could be explained by variations in learning style. The rationale here is that certain majors, such as, engineering (Felder, 1988) and business (Hallock, Satava & LeSage, 2003) with their quantitative nature might attract students with a preference for particular styles of learning that would be well suited to these majors. In the business discipline, investigation of the effects of learning styles on choice of specialisation has been limited with much of the focus on accounting majors (Loo, 2002).

Clump & Skosbergboise (2003) also addressed the effects of learning style on majors, postulating that conflicting results amongst studies that examine learning style differences, such as, between different choices of majors together with other variables that include gender and upper or lower divisional standing might be explained by inter-university differences in the samples.

Hallock, Satava& LeSage (2003) have suggested that particular learning styles might be better suited to online courses and that educators should be able to design online curricula that enhance learning based on the online students' preferred learning style.

Recently, particular preferences for learning styles have been shown to be correlated with academic performance in an online environment (Beadles & Lowery, 2004).If certain learning styles are particularly suitable for online learning in the virtual classroom, then other ones should be better suited to 'traditional' learning in the physical classroom. In their study(Beadles & Lowery, 2004), they expected to find significant differences between the preferred learning styles of online and traditional students, assuming that students will self-select the mode of educational delivery that best suits their preferred style of learning. The study investigated the effect that learning style may have on the choice of educational approach by assessing the differences in learning styles between students who chose to enrol in a traditional programme and those who chose a web-based one.

Based on the advent of web-based learning as a new environment for education, Hallock *et al*.'s (2003) suggested that web-based education may be better suited for students with particular learning styles. An exploratory investigation was conducted in order to assess whether learning styles might be associated with the choice of educational delivery methods. The study confirmed that there are significant relationships between learning styles and the choice made by students who enrol for online education.

According to Mupinga, Nora &Yaw (2006), it is unclear what the learning styles of online students are, thus making it difficult to design effective learning environments. They conducted a study to determine the learning styles, expectations and needs of undergraduate students enrolled in web-based course elements. In order to determine personality types, 131 students completed a Myers-Briggs Cognitive Style Inventory personality test online. The results indicated that, whilst no particular learning style was identified for this group, the study identified the unique characteristics of these students, with approximately half preferring to be alone and needing space and a third expecting to work in groups with on-campus students.

Gee (1990) conducted a study that surveyed 26 students in a teleconference distance education class. The aim of the study was to test student learning style preferences in a distance education or on-campus classroom. Student achievement was measured in terms of course content, completion rates and attitudes towards learning. Gee used the Canfield Learning Style Inventory (CLSI) the results of which indicated that high scorers in all of the student achievement areas possessed an independent and conceptual learning style. In contrast, low scorers in student achievement had a social and conceptual learning style. Furthermore, the results suggested that an independent learning environment was favoured by distance education students, whilst on-campus students preferred working with others. Owing to the small sample size, Gee recommended that there be further exploration of this relationship.

A study by Dille &Mezack (1991) was conducted using the Kolb Learning Style Inventory (LSI), which is often used in distance education learning research. Subsequently, they described it as a cognitive learning style indicator. Furthermore, they used the Kolb LSI to identify predictors amongst high-risk community college students taking classes via tele-courses. Their findings showed that distance learning courses often lead to social isolation, thus resulting in students having greater dependence on independent learning skills. Successful distance education students have less need for concrete experiences in learning.

The literature shows that many studies have investigated the learning styles found in online education or distance education but research that explores the acceptance and use of a virtual learning environment or online education is very rare, if conducted at all. In this research, in order to cover the gap in the literature, the author aims to use the learning style model (LSI) alongside the TAM model in order to explore the acceptance or rejection of the VLE within higher education. This study will give an opportunity for decision-makers, i.e. managers, in Libyan universities to consider these issues. Chapter six will discuss the research methodology that was adopted by this research, namely, a quantitative method will be adopted with two instruments (the TAM model instrument and Kolb's LSI inventory).

4.7 CONCLUSION

This chapter reviewed comparatively the most popular learning style models and selected the most suitable one to be used in the present research. As has been described earlier in this chapter the study concluded which a decision to adopt Kolb' learning style inventory LSI as a tool to be incorporated within the TAM model to investigate the impact of learning styles on the perception of using VLE. After arrive to end of this chapter, the study will now build a comprehensive understanding of the phenomenon, which will assist the researcher to propose and design a suitable research model. The next chapter will present the research framework and formulation of the research hypothesises based on the research questions and selected factors that guided the present research.

5 THEORITICAL FRAMEWORK AND RESEARCH HYPOTHESES

5.1 INTRODUCTION

Chapter two of this thesis reviewed the research literature of VLEs, especially in relation to its adoption. Chapter three introduced a number of theoretical models, which have the potential to adopt and utilise technology that will assist the development of a model for this research. Ultimately, chapter four described a number of learning style models from which the Kolb LSI inventory appeared the most appropriate and is included in this research. The current chapter, therefore, aims to propose the research model for this study. The proposed model will depend mainly upon the attitudes and intentions to use VLE.

The TAM model provided the most influential theoretical background in this respect (Straub *et al.*2004) and it has been adopted as a basic tool to assist the development of this research model. The VLE system will be the application to be investigated by the users. Learning styles is the main factor that will assist understanding of the attitude towards using the system along with its impact on the research model as independent variables. Other external independent variables will be incorporated that are believed to influence the intention of use (described in chapter three) together with the TAM core constructs. These will act as a base as they play a significant role in the intention to utilise the VLE by Libyan students who are the subjects of this study. Thus, this chapter will present the development of the research model that will guide and assist this study in order to answer the research questions.

In order to validate the research model, the study developed research hypotheses, which are presented in this chapter. These hypotheses are based on the research purpose and the questions described in Chapter One. In order to formulate the hypotheses it is appropriate to discuss the rationale for using TAM as a tool and base for building the research model, which is founded on theory that may justify the results of this research. The next section will briefly describe the rationale for using TAM.

5.2 RATIONALE OF THE TAM-BASED MODEL

A number of theoretical models have been developed to understand acceptance of technology. The need to study or investigate the problem of adoption or rejection of technology is currently being considered by many dedicated researchers (Al-Gahtani, 2008). In this context, the Technology Acceptance Model (TAM) is considered to be relevant for studying the acceptance, adoption and usage of information communication technology (ICT) based services. Rigopoulos *et al*. (2008) stated that the TAM is the most acceptable model in IS regarding utilising the system's usage. Further Yuan (2005) reported that TAM is able to explain and predict the level of user acceptance or rejection of the technology better than other available models. TAM is regarded by many researchers as a robust model able to predict the acceptance of technology in a variety of cultural settings (Mathieson *et al*., 2001; Szajna, 1996; Benbasat & Barki, 2007; Swesi, 2008). Furthermore, this model has been validated through examining various types of technologies pertinent to individual and organisation adoption (see Venkatesh, 2000; Chau, 1996; Agarwal & Sambamurthy, 2002; Igbaria *et al*., 1997; Legris *et al*., 2003; Leong, 2003; Saade *et al*., 2004; Wu & Chen, 2005; Mahinda & Whitworth, 2005; Chuang *et al*., 2009;Rigopoulos *et al*., 2008).

According to numerous studies, the TAM appears to be simpler to deploy, easy to use and has been found powerful for use as a determinant of user acceptance of information technology compared to other models. This research, therefore, adopts the TAM as the theoretical basis for this study and it will be extended to form this study research model. Apart from the purpose of this study, i.e. to investigate the attitude of and intention to use and accept VLE by students, there are other reasons for deploying the TAM as a tool to assist the research's investigation. Based on the literature, there is little research into the acceptance of virtual learning environments or web-based learning. This is considered a relatively new technology in higher education. Numerous studies have adopted the TAM for investigations but only for simple IS applications, such as, e-mail, word processing, databases, etc. but VLE is a much more enhanced technology, wider, broader and more complex in nature. Furthermore, it does not just provide technology but also includes multimedia content used for learning, interaction, collaboration and assessment. In addition, owing to the popularity of the internet and other emerging ICTs, the TAM has also been used to study other applications. These include the World Wide Web (Lederer *et al*., 2000; van der Heijden, 2003), websites (WWW) (Agarwal & Prasad, 1997), internet use (Seyal *et al*., 2002; Swesi, 2008), internet banking (Lai & Honglei, 2005), online education WebCT (Sanders & Morrison, 2001), intranet (Horton *et al*., 2001), electronic commerce (Olson & Boyer, 2003; Pavlou, 2003) and online shopping (Gefen, 2003; O'Cass & Fenench, 2003).

As the TAM has been extended to examine online education usage (see Table 3.1 chapter three), it is appropriate to further extend the original TAM model to study VLEs, such as, Blackboard's Course Management System (BCMS) technology as related to previous TAM applications.

5.3 RESEARCH MODEL (VLEAM)

The present study suggests the Virtual Learning Environment Acceptance Model (VLEAM), as shown in Figure (5.1), which is based on the TAM. The proposed model has been upgraded based on the previous study by Swesi (2008), which investigated the robustness of the TAM in another cultural setting. The present model includes seven independent external variables as well as the theoretical learning styles model LSI by Kolb (2000) combined with the TAM to assist in understanding the acceptance of VLEs in the university environment as recognised by their preferred learning styles.

The research model of this study used TAM as a baseline tool for its configuration while excluding actual use (system use) from the original version. This approach will measure the intention to use by understanding the relevant factors including learning styles that influence the belief constructs of PU and PEOU. These will influence the attitude toward use, which in turn will influence the behavioural intention to use VLE. Numerous studies have adopted this approach (Hsu and Lu, 2004; Venkatech *et al.*, 2003; Lewis *et al.*, 2003; Chau, 1996). The rational for excluding system use from the original TAM will be discussed after the study describes system use measurement. Recent literature suggests that intention to use is a concept that can lead to understanding IS success (Burton-Jones & Gallivan, 2007; Barki *et al*., 2007; Brown *et al*., 2002; Rigopoulos & Askounis, 2007; AL-Gahtani, 2008).

As ascertained from the literature, highlighted by Straub *et al*. (1995), the most well-known system usage measurement (actual use) are either *subjective*, such as, self-reported tools or *objective*, such as, computer-recorded ones. Notably, it is considered by some researchers that the adoption of self-reporting tools in research is a replacement for actual usage (Szajna, 1996).Regardless, however, such tools are commonly utilised in field studies to gather information via various means, such as, surveys or interviews.

Subjective (self-reporting)this method is a tool to be applied to field studies or experiences with a complementary instrument, such as, interviews or surveys (Straub *et al.*, 1995). Normally, the investigator will question the sample in terms of their views on the use of an information system; typically, this is achieved through rating systems via a survey or questionnaire (Lucas, 1973; Raymond, 1985, Steinfield, 1985; DeLone, 1988; Davis, 1989). For example, when carrying out research considering user behaviour in relation to IS, as stated by DeLone (1988), the researcher required that the sample scored their opinions according to five different opinions, ranging from 'unlimited' to 'very restricted'. This was done in order to measure and accordingly evaluate users' levels of access to both computers and more specifically, IS.

Despite this tool being widely utilised and accepted, its accuracy in relation to study findings has nevertheless been criticised by a number of scholars. Trice & Treacy (1986) have further stated that there are various issues related to a number of self-reported system usage tools. They claim that such tools do not provide a high enough degree of accuracy when used to determine actual usage. In the same vein, it is explained by Horton *et al.* (2001) that, in the context of TAM-facilitated intranet use, actual and self-reported usage tools are not transposable owing to the lack of accuracy in the estimation of actual usage. Furthermore, as a result of the meta-analysis carried out, it is also highlighted by Sahin & Shelly (2008) that the link between usage and perceived usefulness is much clearer and stronger when utilising tools aimed at self-reported usage based on actual usage. Straub *et al.*, (1995, p.1329)further state, "Since self-reported systems use measures that lead to unacceptable artefacts, the interrelationships between all TAM variables are thrown into question". Indeed, all the past studies that have measured system usage subjectively would be implicated (Straub *et al*., 1995).

As highlighted, there might be limitations and problems of using a self-reported measure, as a substitute to capture IS use. Thus, this method may prove problematic (Fusilier & Durlabhji, 2005).

Objective on the other hand, (computer-recorded logs) usually provide access to objective measures. With this in mind, it is stressed by Staub *et al*. (1995) that a number of researches have been carried out, which have actively sought to calculate actual system usage through accounting software; notably, as emphasised earlier by King & Rodriquez (1981), which records and catalogues the amount of requests made. In addition the work of Ginzberg (1981a) calculated usage by considering computer session occurrence in relation to connect time. When considering the TAM framework, a number of issues have been highlighted by the works of Straub *et al*. (1995) and Chin (1996) both of which query the degree of precision and exactness provided by the usage tool in the case of psychological acceptance. An objective method is not appropriate for survey research since direct observation is difficult to achieve and is not available, which is the case for the present study.

Szajna (1996) mentioned that it is not appropriate to measure actual system use by a self-report indicator. In addition, Agarwal and Prasad (1999) argue that when a study is conducted to gather data at a particular point in time where the perception of usage is based on previous experience, in this case it not appropriate to measure actual use. As a result, researchers recommended that intention is more reliable than actual use since measures are simultaneous with beliefs. Notably, as emphasised by George (2004), it is not suitable to incorporate actual use and intention in a study when the intention in turn reflects the future actual use; however, self-report methods represent the usage that is experienced.

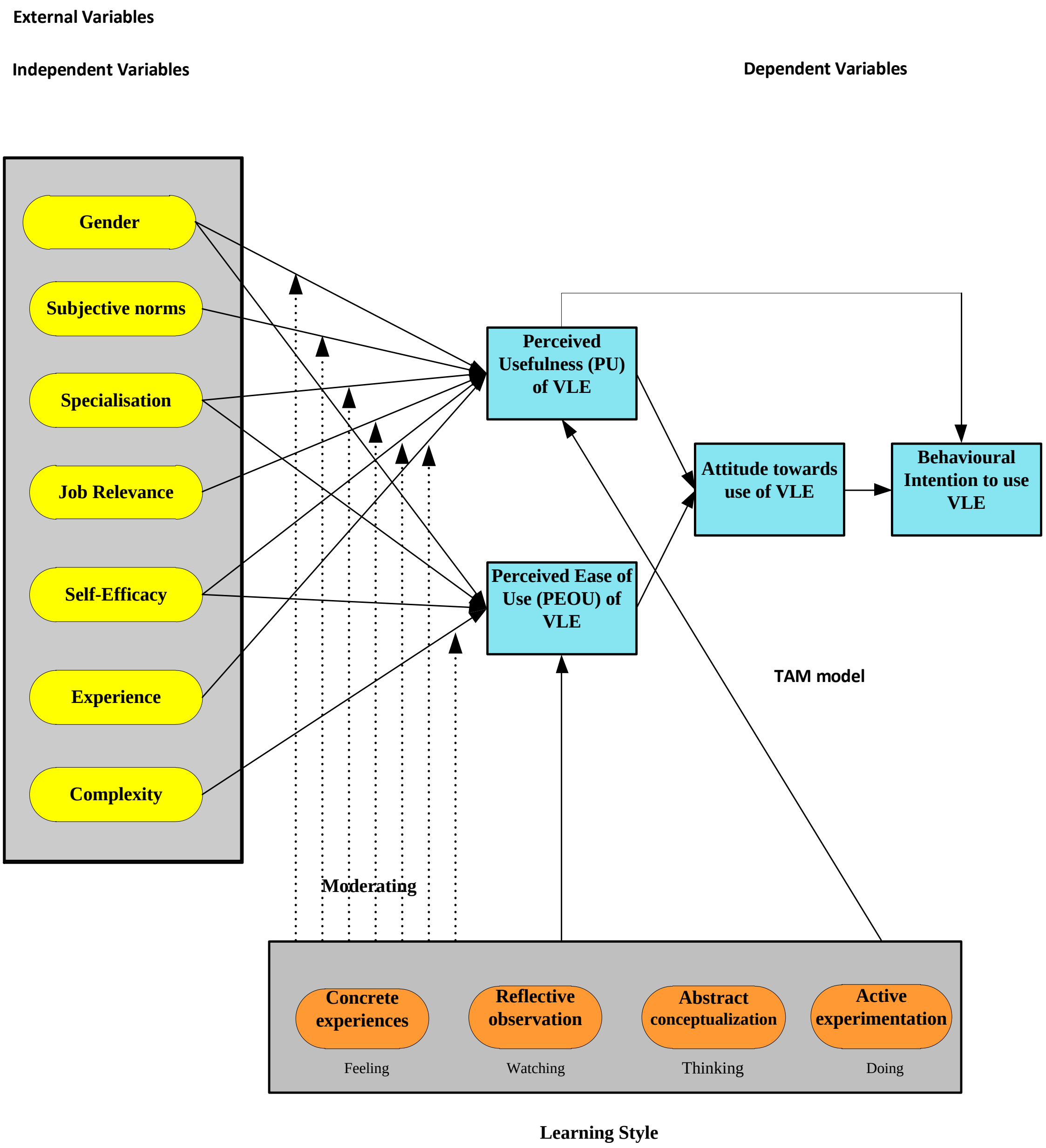
As mentioned above, with respect to the limitations of self-reported measures, it was decided by the researcher to exclude self-reported measures from the proposed model. Furthermore, the VLE in the target university was new and not experienced by the users. It, therefore, was felt unsuitable to ask participants to respond to their usage, which would lead to the capture of inaccurate adoption. This is consistent with previous IS adoption research who excluded the actual use from the original model (Hsu & Lu, 2004; Burton-Jones & Gallivan, 2007; Al-Gahtani, 2008; Lee & Kozar, 2005; Fusilier & Durlabhji, 2005; Lewis *et al.*, 2003; Lee, 2010; Schierz*et al.*, 2010).

According to the TAM literature, it is clear that external factors play an important role in the acceptance of technology, as indicated by the most recent TAM studies (see chapter three). With this in mind, previous studies that used approximately 30–40 different variables (see tables 3.2 & 3.3, chapter three) have mainly resulted in increasing the variance of the model. The present research model has selected variables, which act as antecedents of both perceived usefulness (PU) and perceived ease of use (PEOU). The external variables are gender, subjective norms, specialisation, job relevance, self, efficacy, experience and complexity, which have been presented in chapter three. In this context, the selected external constructs represent independent variables that influence the belief construct and will be expected to increase the variance of the present VLEAM model. In this study, the author developed the VLEAM model described in Figure (5.1) based on two dimensions, namely, learning style (LSI) and external variables. The LSI will influence the beliefs constructs PU and PEO as well as acting as moderators between the TAM beliefs' constructs and the external variables in order to investigate the impact and the importance of learning styles that could influence the perception of students as the purpose of this research. The VLEAM model will contribute to the understanding of the acceptance of VLEs and understanding the relevant factors of its adoption. In order to achieve this understanding the model should be validated. As Gibson & Brown (2009, p. 38) said, "The validation often comes from research in empirical contexts that bear some similarity but which differ in some distinct way or ways and that enable the researcher to make comparisons between settings."

In this research, the current model aims to examine the individual's attitude towards VLE use by positing those external variables, such as, social influence (gender, subjective norms), the control factor (self-efficacy, experience and complexity), specialisation and job relevance as independent variables that have a positive effect on TAM's constructs beliefs (PU and POEU). In return, the beliefs constructs PU and PEOU will positively affect the attitude towards use (ATT) and then the ATT will significantly affect behavioural attention (BI) as the target measurement. Furthermore, in order to increase the rate of adoption, it is importantly posited by this study that learning styles will influence the beliefs constructs PU and PEOU, which in turn will affect the intention BI via attitude ATT. With this in mind, the study suggests that the learning styles will moderate the values of external variables, which will affect the research model (the belief constructs). A more detailed description of the relationships of the constructs with respect to their impacts is presented later in this chapter.

This approach is unique in the IS research and the results will assist other investigators to further extend to other independent variables that could explain the acceptance of technology. This research, therefore, is considered an extension of the TAM model and it will contribute to the explanation of VLE acceptance. The proposed model, referred to as the VLEAM model, makes a contribution to the area of adoption and acceptance of technology. In order, to carry out the analysis and answer the research questions, the hypotheses provide the only way of making this investigation a success. Accordingly, the explanation of all the hypotheses is presented in the next section.

Figure 5-1Research Model



5.4 RESEARCH HYPOTHESES

The aim of this study is to investigate students' perceptions toward and potential use of VLE technology with the use of two different theoretical models that combined with each other produce the VLEAM model shown in figure (5.1).The study posits the relationships between the TAM core constructs and the impact of learning styles, and independent variables which gives rise to 21 hypotheses (see Figure 5.2). In order to make the hypotheses more clear they are divided into three parts, as described in the sub-section below. These will be tested and validated later in a quantitative manner designed for the purpose of this research. The proposed relationships are as shown in Table (5.1) as follows:

Table 5-1Relationships between the variables (constructs)

Construct	→Related to	Comments
Gender	→ PU and PEOU	Positive with PU & PEOU
Specialisation (major)	→ PU and PEOU	Positive with PU & PEOU
Subjective norms	→ PU	Positive with PU & PEOU
Job relevance	→ PU	Positive with PU & PEOU
Experience	PU	Positive with PU & PEOU
Complexity	PU	Positive with PU & PEOU
Self-efficacy	PU and PEOU	Positive with PU & PEOU
Learning style (LSI)	PU and PEOU	PU scores are same for various learning styles
PEOU	PU and Attitude (A)	Positive with PU & PEOU
PU	Attitude (A) and (BI)	Positive with PU & PEOU
Attitude (A)	Behaviour Intention (BI)	Positive with PU & PEOU
LSI	PU	Scores of PU are same of each learning style
LSI	PE	Scores of PE are same of each learning style
LSI	PU & external variables	LSI are moderated variable
LSI	Gender	Percentage same for gender group
LSI	Specialisation	Percentage same for specialisation group

5.4.1 TAM CONSTRUCTS: DEPENDENT AND INTERMEDIATE VARIABLES

Perceived Ease of Use (PEOU) of the VLE

Perceived ease of use (PEOU) is defined as, "The degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p.43). As has been ascertained, Perceived Ease of Use is one of the beliefs constructs which previously hypothesised that has positive impact on both perceived usefulness and attitude towards of use VLE. In the current research, the students feel free of efforts to use VLE if they believe the system is easy to use in turn; this positive relation will increase their attitudes towards use of VLE.

Based on previous studies (Davis *et al*., 1989; Venkatesh & Davis, 1996; Szajna, 1996; Lai & Honglei, 2005; Wang & Wang, 2008) PEOU been found to have a positive impact on PU. In addition, PEOU has a significant effect on attitude (ATT) directly (Chau, 1996; Davis *et al*., 1998; Van Raaji & Schepers, 2008; Chatzoglou *et al*., 2009).Chatzoglou *et al.* (2009) reported that ease of use is a strong determinant and a significant driver for using web-based training via perceived usefulness and attitude. Further, Devaraj *et al.* (2008) surveyed 180 participants and found that ease of use has a significant impact on usefulness and attitude towards using a collaborative system and ease of use is a useful predictor of attitude to use. Similarly, Al-Gahtani (2008) found perceived ease of use is positively related to usefulness and attitude towards technology. In this context, other studies found that perceived ease of use indirectly impacts on intention to use via usefulness (Devaraj *et al.*, 2008; Doyle & Short, 2010).

According to a previous study, Swesi (2008) found that PEOU has significant relationships with Behavioural Intention via PU and these results are consistent with those of Davis *et al*. (1989).Poelmans *et al*. (2008), however, found that perceived ease of use has less impact than PU on intention to use VLEs. While Venkatesh &Davis (2000) stated that PEOU is a strong determinant of PU. Based on validated PEOU by Swesi (2008), the researcher found that PEOU is a strong determinant of PU and in turn, PEOU is positively related to attitude towards VLE. Thus, the researcher hypothesised the following:

H1. Perceived Ease of Use (PEOU) of the VLE is positively related to Perceived Usefulness (PU) of the VLE amongst Libyan university students.
H2. Perceived Ease of Use (PEOU) of the VLE is positively related to Attitude towards use (A) of the VLE.

Perceived Usefulness (PU) of the VLE

Davis (1989) defines perceived usefulness (PU) as, “The degree to which a person believes that using a particular system would enhance his or her job performance” (p. 39). The perceived usefulness reflects students’ beliefs to what extent utilising VLE facilities is beneficial compared to the traditional learning system. Along with relevant beliefs, students’ perceptions of VLE usefulness emerge as a strong determinant of intention. The VLE system can provide a wide range of benefits to students, including convenient access to useful information about their courses anywhere and anytime.

Perceived usefulness is the most determinant factor of usage via behavioural attention (Sun, 2003; Poelmans *et al*., 2008; Chuttur, 2009). In previous and more recent studies, such as, that of Davis (1986) and Vrielink (2008), it has been established that PU directly affects intention to use;however, some other researchers disagree with these results where PU has been found to impact on intention via attitude (Agarwal & Prasad, 1997; Seyal *et al*., 2002). Al-gahtani (2008) has found similar results. Based on VLE being useful for students to interact with their learning and in line with previous studies (Yu *et al*., 2005; Chau &Hu, 2001; Igbaria *et al*., 1997), PU is established as being the best predictor of intention, both directly and via attitude. It has been reported that VLE is perceived useful by students and interactive with their learning (Wang & Wang, 2008; Sumak *et al*., 2010; Jan and Contreras, 2011). A study by Yu *et al*. (2005) established perceived usefulness as being the best predictor of intention to use VLE, both directly and via attitude. Furthermore, Sumak *et al*. (2010) found that the strongest determinant of intention was perceived usefulness.

Thus, as has been found by Swesi (2008), PU is significantly related to attitude as well as to intention to use VLEs and so the researcher hypothesised the following:

H3. Perceived Usefulness (PU) of the VLE is positively related to Attitude towards use (A) of the VLE.

H4. Perceived Usefulness (PU) of the VLE is positively related to Behavioural Intention (BI) to use the VLE.

Attitude towards use of the VLE

According to Ajzen (1991), attitude is defined as the extent to which an individual has a positive or negative assessment about certain behaviour. Attitude towards use, as described by Davis (1986), is recognised as being the effective mediator between beliefs (PU and PEOU) and behavioural intention to use. He defines this as the users' feeling (either positive or negative) towards use, adoption and the wish to undertake such behaviour. Thus, users who have positive attitudes towards using the technology believe that it will increase their productivity and efficiency and accordingly enhance their work (Venkatech &Davis, 2000). Importantly, numerous studies have reported that attitude towards use is a strong determinant of intention to use and enjoys a positive relationship with intention to use (Lu *et al*., 2003; Ha and Stoel, 2009). Yu et al. (2005) also found this, whereby attitude is the cause of intention and has a strong relationship with behavioural intention to use. Sharp (2007) has reviewed various articles related to development, extension, and application of technology acceptance and found that most studies revealed that attitude construct has been found the most predictor of intention to use IS.

Park and Chen (2007) examined acceptance and adoption of the use of smart phones; the findings of the study indicate that behavioural intention to use is mostly influenced by attitude toward using a Smartphone. On the other hand, Park and Chen (2007) found few studies that consider the role of attitude is not important, for example, Hu *et al.*, (2005) stated that attitude is not shown as a significant determinant of intention, and Brown *et al.,* (2002) supported this fact, however, they stated that it is dependent on the matter where employee for example will intend to use the system in order to maintain their job despite their attitudes either positive or negative towards the system. They further highlighted that the importance of attitude frequently associated more to job satisfaction, loyalty to managers, and as prevention to system damage. Moreover, Sun (2003) found that attitude is not a reliable predictor of behavioural intention. This is inconsistent with Swesi (2008) who found that attitude has a strong relationship with behavioural intention to use the internet. Mathieson (1991) has found similar results. Davis and Venkatesh (1999) modified TAM as second version “Parsimonious TAM” and they consider attitude to be an inadequate predictor and thus TAM model is strengthened without the attitude factor. The only determinant of behavioural intention to use is PU and PEOU, which is inconsistent with recent studies. Regardless of the above results, however, the researcher decided to consider attitude as an important construct, as posited by the TRA theory, as well as following Yu *et al*. (2005), who confirmed that attitude has a strong relationship with intention. Nevertheless, Taylor &Todd (1995) state in their results that attitude is not a strong predictor of behavioural intention, however, they also conclude that attitude was a significant determinant of intention for experienced users. Within this context, Chau (2001) reveals that attitude has a strong relationship with behavioural intention to use, confirming that attitude is a determinant of intention (Chau, 2001). Based, therefore, on the literature, the following hypothesis has been formulated:

H5. Attitude towards use (A) of the VLE is positively related to Behavioural Intention (BI) to use the VLE.

5.4.2 EXTERNAL VARIABLES (ANTECEDENTS' HYPOTHESES)

Gender

Few studies have considered gender in IS research (as mentioned in the literature review). Researchers seem to believe that gender does not have an effect on the constructs' beliefs but it does seem to have positive effects in some areas (Venkatesh, 2000). Few researchers argue on the impact of gender. Some researchers have established various positive relationships, whilst others have not (see Sherman *et al*., 2000; Sanders &Morris, 2000; Anderson, 2001; Hong, Ridzuan & Kuek, 2003; Durndell &Haag, 2002; Tsai *et al*., 2001; Dugan *et al*., 1999; Taia, 2000; Mansour, 2004).

The literature describes examples of research that demonstrates that gender differences are related to usage, such as, the acceptance of VLEs (Milis*et al*. 2008). Another earlier study by Gefen &Straub (1997) reports differences between males and females in their perceptions of technology usage. Furthermore, Mansour (2004) found various gender differences between males and females regarding their attitudes. A study by Teo &Lim (1996), however, reports that gender has no impact, subsequently highlighting no differences in their perceptions of perceived usefulness. Another study by Morris (2000) suggests that females perceive technology ease of use more than males whilst males perceive technology to be useful. In the current study, the researcher summarises that males are influenced by perceived usefulness. Females, however, tend to view technology as being less easy to use and they are influenced, therefore, by perceived ease of use. Thus, the study posits the following negative hypothesis:

H6. There will be no significant difference in scores of perceived usefulness of VLE between male and females.
H7. There will be no significant relationship between gender and perceived usefulness of VLE.
H8. There will be no significant difference in scores of Perceived Ease of Use (PEOU) VLE between male and females
H9. There will be no significant relationship between gender and Perceived Ease of Use (PEOU) of VLE.

Subjective norms

As the main construct in the TRA theory, subjective norms play a significant role in explaining the model, although Davis (1989) has ignored this in his earlier research. Venkatesh &Davis (2000), however, confirmed its importance in terms of its influence on the belief constructs and subsequently suggested further research into its impact on the acceptance of technology. In their study, Venkatesh &Davis (2000) reported that individuals were influenced by others important to them, therefore, leading them to think that they should perform the job. Furthermore, Chang and Cheung (2001) points out that individuals respond to social normative impacts in order to maintain a favourable image within their group. In terms of the intention to use, Yu *et al*. (2005) stated that subjective norms such as (family, peers, and teachers) have a significant influence on intention to use via PU. Similarly, Venkatesh &Morris (2000) highlighted that the construct of subjective norms is positively related to PU. Van Raaij & Schepres (2008) examined subjective norms in their proposed model and they found a significant impact of the subjective norm as social pressure on the intention to use VLE via perceived usefulness.

According to Hofstede's (1980) studies on culture, it was reported that Libya is considered a collectivist society, where individuals should be influenced by each other to perform certain actions, such as, in the case of using VLEs in the university context. Accordingly, the study can formulate the following alternate hypothesis:

H10. Subjective norms are positively related to Perceived Usefulness (PU) of the VLE.

Specialisation (Major)

Specialisation is defined as the subject of study, whereby the student can pursue and improve his/her career during his/her time at university. Owing to cultural differences, particularly in developing countries, it has been noticed by the researcher that individuals from non-engineering backgrounds do not consider technology use such as VLE as a tool that can assist their education (job-related) or their studies requiring technology, such as, use of computers and the internet. This may inconsistent with other developed countries were technology use is more usable by most specialisation within education organisation. For this reason, this study has included specialisation as an independent variable with a positive relationship to PU and PEOU into the research model. As this new variable has been introduced in the author's previous study, the researchers interested to explore the impact of the specialisation construct upon the usage of VLE. As indicated earlier, the IS literature revealed a dearth of research using specialisation as an independent variable in the TAM model. In the previous study (Swesi, 2008) it was found, that specialisation has a significant role to play in the acceptance of technology. In this regard, Hong *et al.* (2003) stated a significant difference of technology use, which depended on the type of faculty. He reports that engineering, science and technology schools have different perspective than humanities and psychology departments (Hong *et al*., 2003). Moreover, Anderson (2001) presented the differences in the perceptions of students regarding internet usage between different schools.

The hypotheses in this regard are posited as follows:

H11. The specialisation (major) of a student is positively related to Perceived Usefulness(PU) of the VLE.

H12. The specialisation (major) of a student is positively related to Perceived Ease of Use(PEOU) of the VLE.

Job Relevance

As an independent variable, job relevance is defined as 'users' perceptions of the degree to which the system to be used is relevant to and fits well with their job (Venkatesh, 2000, p. 191). Therefore, users will utilise the technology to be useful if is it relevant to their job (Venkatesh &Davis, 2000). Moreover, "It is unlikely that respondents would perceive the various advantages of using the PWS, if its use were in fact not compatible with the respondents' experience or work style" (Moore & Benbasat, 1991, p. 208).The study introduced this construct for the purpose of measuring how students perceive the use of VLE in their studies.

Venkatesh &Davis (2000) stated that job relevance influences perceived usefulness. Another study by Chismar &Wiley (2003) noted that job relevance had a positive effect on perceived usefulness (PU), where physicians accepted technology because it is relevant to their job for internet-based health information. Furthermore, Hart &Porter (2004) also confirmed a positive relationship with PU in their research. This was consistent with the results of Swesi (2008). Kim (2008) adopted job relevance as a moderating factor in order to explore its moderation for mobile wireless acceptance; he found job relevance is the strong determinant of mobile wireless acceptance. According to Venkatesh &Davis (2000),the researcher can formulate the following hypothesis:

H13. Job relevance is positively related to Perceived Usefulness (PU) of the VLE.

Self-efficacy

Self-efficacy is defined as the perception that individuals have the ability to perform a particular task (Bandura, 1977). In this regard, numerous studies have found a significant relationship between self-efficacy and belief constructs, such as, PEOU (see, for example, Agarwal, *et al.*, 2000; Reid & Levy, 2009; Babic & Jadric, 2010). Furthermore, Reid & Levy (2009) found that self-efficacy has a significant relationship with PU and PEOU. Further, Wu *et al*. (2008) state that computer self-efficacy is an important antecedent of both perceived usefulness and perceived ease of use; however, perceived ease of use has an adverse effect on perceived usefulness within the science-teaching context. In the context of E-learning, Roca *et al.* (2006) include self-efficacy in their model to examine the capability of students to accept using e-learning services.

They hypothesised that the variable will influence only ease of use. The findings showed that self-efficacy is a strong determinant of e learning indirectly via ease of use. Similarly Liu (2010) reported that Wiki self-efficacy (internal control) significantly correlated with user's perceptions of ease of use and with the actual utilization of Wikis. Some studies, however, are unable to confirm this type of relationship Chau (2001), for example, reports an insignificant relationship. Lewis *et al*. (2003) reveals that there is no relationship between self-efficacy and perceived usefulness (PU).

Although previous research results differ, in this study the researcher expects that there will be a significant relationship between self-efficacy and beliefs constructs, either positive or negative, owing to students who may have abilities to use new technology because of the ubiquity of similar technologies. This means, if they have the ability to use technology without any support or assistance they will then accept using technology. This suggestion was confirmed by Womble (2008) who state that individuals with high computer usage and self-efficacy showed confidence in their ability to control their destiny when using IT. Thus, this factor will play a significant role in the acceptance of VLEs if students have the ability. Therefore, regardless of the inconsistency of the results, it is hypothesised, based on findings of Wu *et al*. (2008), that:

H14. Self-efficacy will be positively related to Perceived Ease of Use (PEOU) of the VLE.

H15. Self-efficacy will be positively related to Perceived Usefulness (PU) of the VLE.

Experience

Many researchers, such as, AL-Gahtani (2004) have found that user experience is very important. A study by Kim (2008) stated that the individuals adopt a technology if it is within their prior experience. They further reported that experience is very important for users before adopting or accepting the use of technology. In their early work, Ajzen & Fishbein (1980) stated that experience has an effect on the adoption of technology and the role it plays in determining behaviour (Ajzen & Fishbein, 1980). Furthermore, the experience variable has been found to be a strong determinant of intention to use via PU and vice versa, if the users were not experienced (Taylor& Todd, 1995). Furthermore, experience has a significant relationship to PU if users have enough experience, as posited by Igbaria *et al*. (1995). Other studies also report the relationships of experience alongside belief constructs (Davis *et al*., 1989; Adams *et al*., 1992; Venkatesh, 2000; Segars &Grover, 1993). Moreover, other studies have confirmed that computer experience is positively related to system usage (Delone, 1988; Fuerst &Cheney, 1982; Igbaria *et al*., 1989; Kraemer *et al*., 1993). In this regard, computer experience has been used as an independent variable, which subsequently established that prior experience would increase its usage (Igbaria *et al*., 1995). Thus, the following hypothesis is proposed:

H16. Experience of the VLE is positively related to Perceived Usefulness (PU) of the VLE.

Complexity

Rogers (1991) who adopted complexity as one of the main factors in his theory defined it as the degree to which users perceive the technology to be difficult to use. Moreover, Chau &Hu (2001) declared that as technology becomes more complex, it will reduce the level of relationship to usefulness and will then accordingly decrease the intention to use technology. According to Igbaria *et al*. (1996), there will be significant relationships between complexity and usefulness, with the hypothesis, therefore, not rejected. Based on the work of Igbaria *et al*. (1996), the researcher hypothesised the following:

H17. Complexity is positively related to Perceived Usefulness (PU) of the VLE.

5.4.3 LEARNING STYLES

Hypothesis testing illustrates deductions about a selected sample of a population (Oates, 2006). Hypotheses "Are tentative, intelligent guesses posited to direct one's thinking toward the solution of the problem." (Leedy & Ormrod, 2001, p. 60)

A literature search revealed that no previous studies exist particularly in relation to the relationships of beliefs constructs and learning styles; hence, this study relied on guesses (hypotheses) and expectance that learning styles have an impact on the research model that is based on the research questions. As previously discussed, learning styles are an important factor that could influence students' perceptions towards using VLE technology. This study posits five hypothesises in order to respond to the research questions.

Learning Style and Perceived Usefulness

the following are two hypothesises which describes two different influence of learning styles on the research model specifically the influence on the beliefs constructs. The first describes the impact of learning styles directly on the perceived usefulness (PU), while the second hypothesis describes the influence of learning styles as moderated factor between beliefs constructs and external variables included in the research model.

H18a. The average perceived usefulness score is the same for all four learning style groups.
H18b. The relationship between various independent variables and PU under TAM model is moderated by different learning styles.

Learning Style and Perceived Ease of Use

H19. The average perceived ease of use score is the same for all four learning style groups.

Learning style with Gender and Specialisation

H20. The percentage of study participants in each learning style group is the same for males and females.
H21. The percentage of study participants in each learning style group is the same for students of different specialisation groups.

5.5 THE HYPOTHESES AND ITS ASSOCIATIONS WITH THE RESEARCH QUESTIONS AND VLEAM

In order to provide a clear summary for this chapter, this section discusses the relationships between the research questions (see chapter one), the research model VLEAM and the research hypotheses formulated in the previous section.

Figure 5.2 shows the relationships between the TAM belief constructs and the external factors (H8-H17) → (PU and PEOU). This figure also shows PU and PEOU, and its relationships to attitudes (H2-H3) → (ATT) as well as between attitude and behavioural intention (H5) → (BI). In order to answer the research question concerning the learning styles' impact on the acceptance of VLE, this research posited that learning styles have significant and direct relationships with the TAM belief constructs i.e. (H18a-H19) → (PU and PEOU). In addition, they also play a significant role by moderating the relationships between the TAM constructs and external variables (H18b) → (External and PU and PEOU). The research model VLEAM in Figure(5.2) shows the relationships and hypotheses between the TAM model, as the base model, with its core constructs, namely, Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Attitude (ATT) as independent variables together with Behavioural Intention to Use (BI) as a dependent variable. The left hand side of this figure shows the external variables, namely, Gender, Subjective Norms (SN), Specialisation (SP), Job Relevance (JR), Self-Efficacy (SE), Experience (EXP) and Complexity (CX) as independent variables that had positive relationships with PU and PEOU. The latter two are dependent variables and increase understanding of the acceptance of VLE. Further, the learning styles model was combined with the base TAM model. The learning styles model acts as independent variables to the TAM core constructs, whilst simultaneously moderating the effects of external variables on PU and PEOU. This model will contribute to the body of knowledge of IS research. It is an extension of TAM theoretical research and it will assist in the understanding of acceptance of the VLE in a university context depending on the preferred learning style of the student.

Figure 5-2 Research model VLEAM and the relatyionships ofconstructs

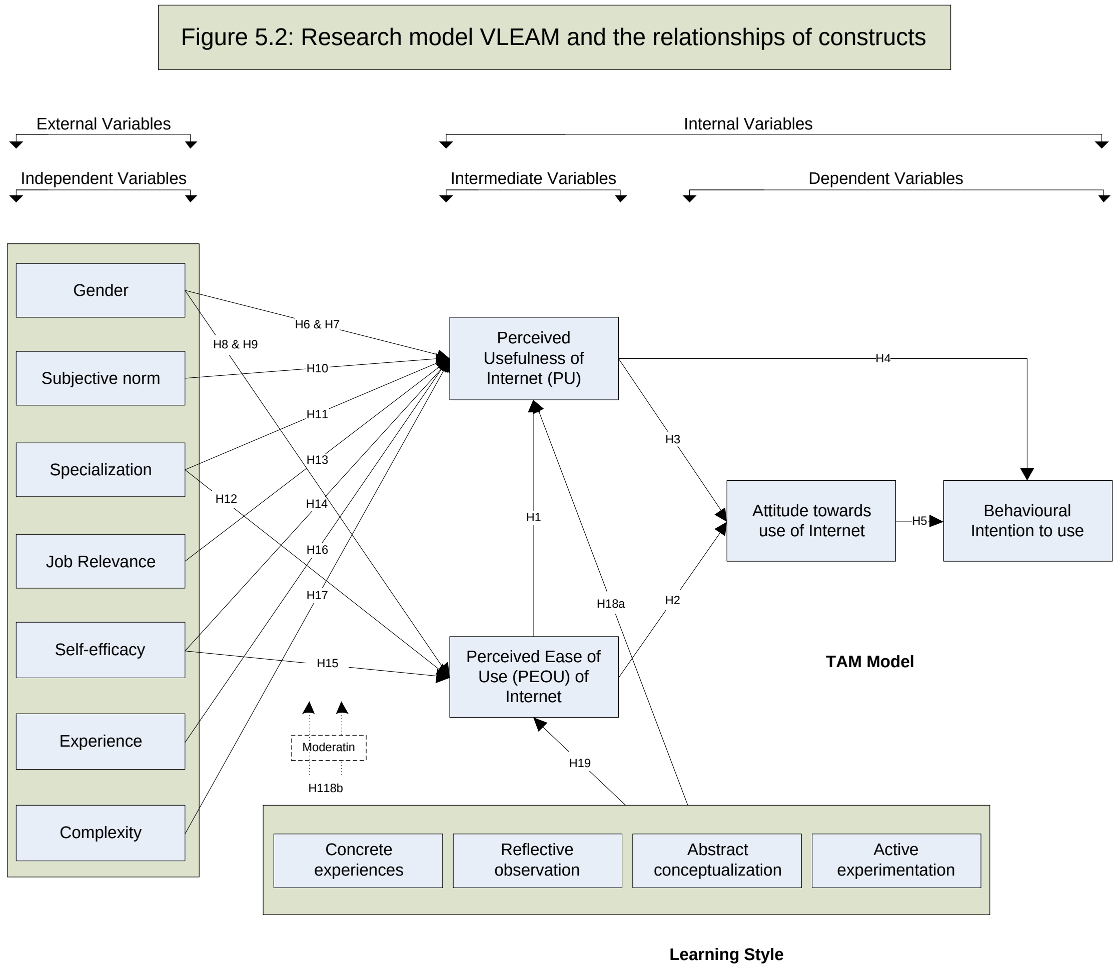


Table (5.2) shows the relationships between the research questions and hypotheses that guide this study. The study viewed question one to be the main research question, which aimed to investigate the attitude of and intention to use VLE based on students' learning styles. This investigation represents the entire aim of the research. This has led the author to introduce the hypotheses separately so each one represents the influence of each factor owing to the independency of the factor itself. Notably, however, assembling all the hypotheses together will provide the aim of this research.

Table 5.2: The relationships of research questions and research hypotheses

Research Question	Hypothesis	Hypothesis Number
What are the perceptions of the students their attitude toward and behavioural intention to use Blackboard's Course Management System (BCMS) based on their learning style?	This research question is considered the umbrella for the majority of hypothesis from the TAM variables relationships to external relationships and the impact of learning styles on the model	H1,H2,H3,H4, H5,H6,H10, H11,H12,H13 H14,H15 H18,H18A,H19
What are the roles of specialisation constructs and the impact of learning styles on the acceptance of new technology (VLE) among Libyan university students?	H11. The specialisation (major) of a student is positively related to Perceived Usefulness (PU) of the VLE. H12. The specialisation (major) of a student is positively related to Perceived Ease of Use (PEOU) of the VLE. H18a. The average perceived usefulness score is the same for all four learning style groups. H19. The average perceived ease of use score is the same for all four learning style groups.	H11, H12 H18A,H19
Are there any significant relationships between gender group and learning styles?	H20. The percentage of study participants in each learning style group is the same for males and females	H20
What is the impact of the learning styles on the factors that related to the TAM?	H18b. the relationship between various independent variables and PU under the TAM model is moderated by different learning styles	H18B

5.6 CONCLUSION

This chapter presented all the requirements needed to develop the research model based on the literature described in chapters two, three and four to investigate the attitude of and intention to use the VLE system (technology).Subsequently, the chapter proposed the research hypotheses that were built upon the suggested research model and research questions. The chapter moved on to describe the relationships between the research questions, hypotheses and its relationship to the proposed model. This chapter then provided an initial answer to the research questions. To test and validate hypothesises and the research model chapter eight will describe all details required to this investigation. To achieve this, the study needs to identify an appropriate methodology, able to justify the research's purpose and answer the research questions. Therefore, the next chapter will describe a suitable methodology and the strategies required to conduct this research.

6 RESEARCH METHODOLOGY

6.1 INTRODUCTION

The previous chapter described the research model (VLEAM), which was based on the literature review. The description included the model's development, variables and their relationships together with the research hypotheses, which detail the influences of all the variables that act on the research model in order to validate it. Therefore, this chapter aims to describe an appropriate research methodology that will guide this research to test its hypotheses and validate the research model in order to investigate the impacts of the variables on it. This chapter starts by presenting the purpose of the present study, which helps to explain the way the research is conducted and the rationale for selecting a suitable research methodology. This is followed by a discussion of the research methodology involving a description of and use of quantitative and qualitative methods. Justification is offered for the choice of an appropriate methodology for this research. The chapter then moves on to describe some popular research methods and briefly discusses the most appropriate research technique to collect empirical data and reasons for a possible choice. From there, the chapter continues to detail the sampling techniques and processes used to gather the relevant data. Finally, the chapter describes the challenges that are posed by the research topic; details the plan and anticipated outcomes of the research.

As described in chapter one, the purpose of this research is to investigate the factors that affect students' perceptions and acceptance of a Virtual Learning Environment (VLE) by incorporating learning styles as the main factor. This research is specifically concerned with the influence of student learning styles preferences with other independent factors towards their intention to use VLE. In light of this purpose the research questions described in chapter one were formulated and underpin the research methodology.

6.2 METHODOLOGY

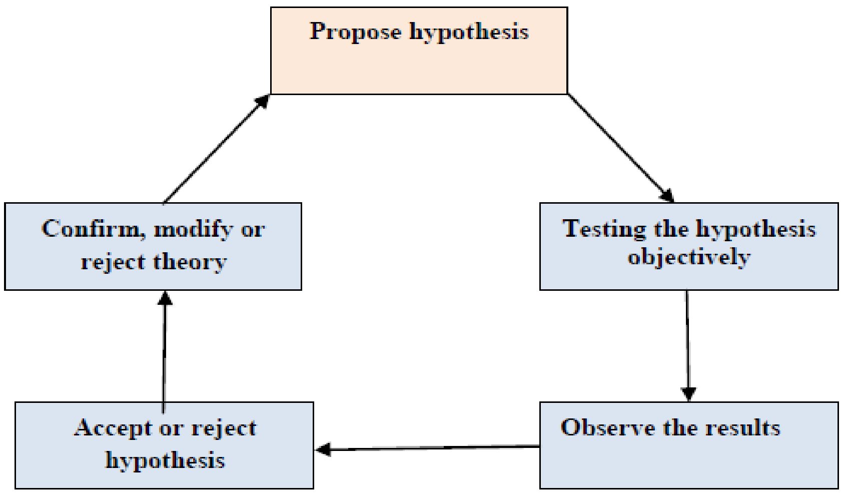
Even though many research methodologies and approaches were available in order that this research can answer the current study's research questions, the appropriateness of the methodology used is established by the sort of information and knowledge a researcher intends to acquire and achieve from a study. It is highlighted by Bryman (2007) and Kothari (2006) that researchers are free to utilise the methods that are most suitable to answer their research questions and in order to establish these they should be based upon the research question instead of the paradigm. Therefore, in this study in order to find an appropriate methodology to examine the present study research questions, the researcher considered different research methodologies and approaches that had been used in previous research to investigate students' perceptions and acceptance of the online learning.

Information system (IS) research has previously adopted a diversity of research paradigms. A research paradigm has been defined by Oates (2006, p.282) as, "A set of shared assumptions or ways of thinking about some aspect of the world." There are two broad paradigms or underpinning schools of thought:

- the positivist school, which is generally adopted by the natural and physical sciences
- the constructivist or interpretivist school, which is generally followed by social sciences and the humanities (Kuhn, 1970)

The positivist school is based on the belief that in generating knowledge about phenomena, there is the need to use quantitative methods, which are expected to produce measurable, tangible and objective results (Holstein & Gubrium, 1998; Silverman, 1997). Further, Willig (2001) highlighted, that positivists consider reality is objective in that there are relationships between people's attitudes or beliefs and the existing world. In the positivist paradigm, researchers can test a hypothesis to generate knowledge via existing relationships of cause and effect (Chen & Hirschheim, 2004). Knowledge can thus be formed through this approach via the following cycle (see figure 6.1) suggested by Oates (2006):

Figure 6-1positivist paradigm cycle



The other paradigm, the interpretive school, emphasises the use of qualitative methods in generating knowledge. Interpretivists often make the case for the role of value judgement and subjectivity as a key determinant in studying human beings. Orlikowski and Baroudi (1991) confirmed that researchers gather and develop information about phenomena or the world subjectively. Furthermore, researchers who use this paradigm tend to establish theory obtained from the outcome of the research (Patton, 2002). This is opposite to positivist paradigm assumptions. In positivism, understanding of the phenomenon can be obtained from the participant's views that produce and possess meaning. Accordingly, this is the case for the present research, which seeks to understand the attitudes and beliefs about the target phenomenon from the views of the participants. Positivist research mainly starts by developing models based mostly on theory and then creates hypotheses, which reflects the aim of the research and typically adopt a quantitative approach in order to test and validate the hypotheses (Cohen & Maldonado, 2007). Moreover, Bryman (2004) argued that the relationships of cause-effect could be examined by hypotheses testing practice. Interpretivist research, on the other hand, does not initially propose hypothesis but starts by exploring the reasons and meanings that people hold and then summarises their views objectively (Abbott, 2010). According to the above discussion, although there are different research methodologies and approaches that can be deployed to cover the objectives and the research questions of any research, the suitability of the methodology that is finally selected is recognised by the type of information a researcher aims to achieve from the phenomenon. Cohen & Maldonado ((2007) importantly highlighted that in order to answer the research question researchers can adopt any most appropriate method for their investigation, however, the focus for recognising these should be on the research question instead of the research paradigm. This means the nature of the study is the criteria that should be considered when selecting the appropriate research paradigm. As a result, the researcher decided that the most appropriate research paradigm for this research is the positivist one.

In this study, the Technology Acceptance Model (TAM) was employed as a base model and used to investigate and measure students' perceptions towards the use of VLE. Notably, it is stated by Lee et al. (2003) that most TAM-based research employed quantitative data and rely mainly on questionnaire-based field studies, such as, (Szajna, 1993; Straub *et al*., 1995; Brown *et al*., 2003; Subremanian, 1994; Igbaria, 1993; Anandarajan *et al.,* 2000 Venkatesh & Davis, 2000; AL-Gahtani, 2008). Moreover, the study also incorporated learning styles and used LSI inventory developed by Kolb (2000). This inventory was designed as a survey to identify the individual preferred styles. "Kolb's learning style inventory (LSI) is a methodology to assess such individual learning styles" (Bechter & Esichaikul, 2008, p121).

For this reason and because of the nature of the current research, the study employed a quantitative method. Lee *et al.*, (2003) suggested that involving qualitative methods is useful in order to gain rich information as supplemented knowledge in a quantitative manner. A similar view is concluded by Chuttur (2009) who claimed that qualitative methodology is a valuable additional approach in this type of study as it provides the researcher with new insights. It is felt appropriate to describe both methodologies used in IS research and justify the method have has employed by the current research. The next subsections detail the quantitative and qualitative methodologies.

6.2.1 QUANTITATIVE METHODOLOGY

Conventionally, a distinction is often made between qualitative and quantitative research methods. In IS research two common approaches are used to gather data. This method emphasises the use of statistical data to generalise about findings that explain and predict events in the social world. This is done by examining the relationships between variables in a measurable manner, which conforms to the positivist methodological persuasion. The positivist view is based on the belief that the causal correlation between two or more variables can be subjected to rigorous statistical and systematic analysis to arrive at an informed proof of the relationship between phenomena (Kuhn, 1970). Thus, according to positivists, theory is a product of composite knowledge that accrues from validity and generalisation derived from summation of the facts and figures that reinforce existing empirical findings. The reinforcement process takes one or a combination of two forms: acceptance and/or rejection of existing knowledge (Smith, 1998).

The quantitative research approach focuses on the causal relationship between phenomena. In other words, to arrive at the evidence of the link between variables, there is the need to generate and analyse data in both a logical and numerical form. In applying the quantitative method to study the social world, it is necessary to use generally acceptable, standardised instruments, i.e. identical to those used in the natural sciences, so that the varying perspectives and experiences of people can fit a limited number of programmed response categories usually identified qualitatively. Surveys and experiments are used commonly for data collection in the case of quantitative research (Bryman, 2001; May, 2001).

One of the advantages of the quantitative method in IS studies is that it makes it possible to measure the reactions of a great many people to a limited set of questions, thereby aiding the comparison and aggregation of statistical data across a range of premises. The second advantage of the quantitative method is that the means and end of generating data are universally acceptable and, therefore, are less prone to confusion or distortion (Smith, 1998).

The major disadvantage of the quantitative approach is that the underlying assumptions of natural science and, therefore, the natural environment, are imported in studying the social world. Unlike the natural sciences, which often allow for the control of the research environment (for instance, pressure, temperature and so on), in the social sciences, it is impossible to pre-determine human behaviour. Thus, static premises that induce investigation in the natural world cannot conform to the reality in the social world. In addition, whilst it is possible for the researcher to operate independently of his/her object of investigation, in the social and management sciences, it is by no means possible for the researcher to detach him-/herself from the people being studied. In social sciences, findings based on quantitative analysis could be shallow and, hence, not representative of the true dynamics of the research question under examination (Bryman, 2001).

6.2.2 QUALITATIVE METHODOLOGY

This method emphasises the use of ethnographic data in making generalisations of the relationships between phenomena in the social world. The basis of creating knowledge by the qualitative method, therefore, conforms to the interpretivist paradigm. The interpretivist view is based on the assumption that the relationship between two or more variables can best be captured through human interaction and expression, rather than through abstract statistical analysis (Atkinson &Hamersley, 1998).

The qualitative method involves creative, pro-active and personal contact between the researcher and the researched in generating information from the people through the documentation and analysis of their perceptions and opinions. The researcher is usually interested in two manners of expression from the object of study: verbal communication, which involves the use of sound and word to transmit opinion; and non-verbal or action communication, which includes the use of physical gesticulation, such as, body language, written statements, inter-personal interaction and so on.The evidence can then be analysed as a behavioural pattern (Atkinson &Hamersley, 1998). Qualitative research is carried out through a variety of techniques in order to gather data. These include a literature review, which allows for the problematisation and or deconstruction of existing knowledge generation of a research problem and questions, eliciting socially constructive data from the object of study through one or a combination of case studies, focus group discussions and interviews (structured, semi-structured or unstructured).

In addition, qualitative research focuses on exploring in-depth the richness and significance of individual experience (Cooper, 2001). The researcher's real aim and task are to discover the world as the respondent experiences and understands it and to communicate whatever it is available through the respondent's eyes (Hammersley, 2004). A qualitative method produces typically a significant amount of information about a much smaller number of people and cases. This method increases the understanding of the cases and situations studied, although it reduces generalisation. In fact, the major challenge of the qualitative approach is lack of generalisation (Oates, 2006).

There are several advantages of the qualitative method. First, both the researcher and the researched are constructively engaged in generating knowledge; accordingly, there is more transparency and openness in gathering data. This contrasts sharply with the quantitative method where the researcher is shielded from the people by statistical barriers. Secondly, the method is responsive to the dynamic nature of human beings and does not make static generalisations about social phenomena. Rather, what it tries to do is offer an explanation for the relationship between variables through the voices and actions of those being studied.

6.2.3 METHODOLOGICAL JUSTIFICATION

This research aims to examine the prospects of Libyan university students accepting and adopting VLE technology. In order to achieve this objective, an appropriate research methodology had to be identified and planned. There is an increasing tendency forIS researchers to rely on quantitative analysis (Szajna, 1993; Straub *et al*., 1995; Brown *et al*., 2003; Subremanian, 1994; Igbaria,1993; Anandarajan, Igbaria &Anakwe,2000; Dabholkar &Bagozzi,2002; Venkatesh &Speier,1999; Anandarajan, Igbaria&Anakwe,2000; Venkatesh &Davis,2000; AL-Gahtani,2008). Therefore, a quantitative approach appears to be the appropriate methodology to guide this study. The rational for the selection of the quantitative approach for this research is briefly presented as follows. First, the research developed model is based on theory that is testable and will produce findings. These findings will guide the model's (theory) validation and enable the hypotheses to be examined. This matches the deductive approach, which reflects the statements and processes of a quantitative approach. Second, owing to the target population comprising only of university students, the researcher established a large sample to investigate the key factors that may influence users' attitudes and attentions of using VLE. This can be done by linking the cause and effect of the variables' relationships to gain the outcomes over a wide range in order to generalise the phenomena. Thirdly, in order to follow IS research the quantitative approach has been chosen to explore the consistency and inconsistency in the findings of previous research. Past studies assisted the researcher to develop and measure previously validated variables that were constructed in the research model. Fourth, as suggested by Malhorta and Birks (2003), quantitative research is appropriate for measuring both attitudes and behaviour to gain reliable results. Therefore, as noted earlier, the quantitative research approach is an appropriate one and was chosen to guide this research. The selection of the research methodology will help the researcher to develop an appropriate research instrument which will assist in testing and validating the proposed model VLEAM.

This approach risks the limitations of producing a uni-linear result, i.e. one based on the outcome of a single research methodology and this is one of the limitations of the present research. To overcome this ‘uni-linear limitation’, it will be necessary in future research to combine, in a complementary manner, both quantitative and qualitative research methodologies. Bryman (2001) termed this approach a dual-strategy, whilst Miles & Huberman (1994) suggest that it is often desirable to integrate a variable-oriented and a case-oriented approach to data analysis. Combining quantitative and qualitative approaches in the study has two interlinked merits. The findings of the combined approach are likely to be more precise, significant and secure, since they emerge from co-ordinates established through comparisons, overlaps and interactions of the various results. This results in a more complete, concrete and holistic construction of the phenomenon being studied and can thus lead to the emergence of a synthetic view of the problem shaped by mixed outcomes (Bryman, 2001). Despite the advantage of using both methods, it is recognised by the researcher that the limitations imposed upon this research prevented adopting both methods. If this were the case then analysis could have proceeded via triangulation methodology. Time constrains were the main reason that prevented the researcher from undertaking the other approach (qualitative method), which would involve interviews, case study and or focus groups. The researcher, however, was motivated and discussed and designed some semi-structured interview questions related to both core TAM factors along with the external variables. These were sketched as attempted ideas.

The researcher decided to adopt the quantitative approach regardless of these advantages. This is because of the adaptation of learning styles inventory in this study. It was felt that an appropriate way to proceed was with one single approach to unite the process of distribution of the two instruments i.e. the TAM based-questionnaire and Kolb's LSI questionnaire. It may be possible to research TAM qualitatively. Indeed this has been successfully achieved by previous studies and their research models could be appropriately validated. These researches were based on TAM using other approaches (Fitzgerald *et al.*, 2003; Ristola, 2008; Blue, 2006; Lin & Fang, 2011). A second instrument of Kolb's learning styles is designed based on a questionnaire. Its items have been formulated to be constant as designed but not yet developed in a qualitative manner. It was felt that it would not be convenient at this stage to conduct qualitative research on the side related to TAM and ignore the other side of the learning styles.

Thus, as reported by Bryman (2007) with regard to the role of the research questions in guiding the decisions that identify the research's design and methodology he said, "Research methods need to be tailored to the research questions that guide an investigation" (p. 5).

In the light of that discussion and based on the nature of the developed VLEAM ,which combines TAM, Kolb's Learning Style Inventory and the formulation of the current research questions to guide the research methodology for the present study this study employed quantitative methodology as one single method.

6.3 RESEARCH METHOD AND INSTRUMENT

It is important to examine broadly the subject matter that relates to research methods with a view to understand the generic framework that informs the choice and strategies for the method used in this research. A research method is defined as the technique that is used to gather data from the target subject (Bryman 2004). There are various methods available to collect data such as Survey, Case Study, Experiment, Action Research, and Ethnography. The survey is the most accepted method for collecting data. It is be able to acquire attitudes, views or other constructed aspects. The main goal of the survey is to generate generalisations via a large sample of a population that covers a broad area (Cresswell, 2003). Questionnaire and semi-structured interviews are the main popular methods deployed in survey research (Bryman, 2004). Oates (2006) added that observations and documents are another way to collect data associated with surveys. He maintained that survey methods are typically related to positivist paradigms if the former are concerned with generalisations. For this study, the method for collecting the quantitative data was a survey, using a questionnaire.

6.3.1 RATIONAL OF USING SURVEY

The merits of questionnaires for this kind of research need no over-emphasis. It has been argued by many scholars that questionnaires represent a useful method for generating a broad range of data about the characteristics investigated (Williamson *et al.* 1982). Furthermore, they are flexible and adaptable in terms of the wide variety of subjects and research problems (Williamson *et al*, 1982). In terms of cost implications, it has been asserted, "Questionnaires are cheap not only because there are no interviewer wages and travel costs but also because usually most of the questions will be closed one, which reduces the expenses data" (The open University, 1975).

Bailey (1978) has discussed the comparative cost advantage of questionnaire over interview methodologies. The researcher said, "Interview costs are rising these days as are labour costs. Questionnaires tend to consume less time than other methods."

Questionnaires may be completed at the convenience of the respondents and guarantee informed consent. They allow the respondent to consult personal records, confer with colleagues or even conduct research before responding (Bailey, 1978).

A questionnaire is a more reliable technique other available techniques such as case study, and interview and is be able to collect data from a large sample by presenting a collection of questions to all participants to gain knowledge. A questionnaire technique is more suitable for examining and collecting attitudes, beliefs and behaviour concerning particular issues in order to know the attitude not to control (Malhorta &Birks, 2003). According to the above discussion, the most appropriate research method that fits this research's purpose, described in chapter one, is the survey questionnaire. The rationale for this is as follows: (1) It matches the selected research paradigm and is associated with the selected strategic approach. (2) This method is suitable to collect the target data, which is to measure attitude, beliefs and behaviour within large sample. (3) This research involves a learning styles (LSI) survey to measure the preferences of VLE users and LSI is constructed based on a questionnaire. (4) This method covers most of the specialisation that relate to VLE users and it will reach all the participants. This method will assist in achieving the research's objectives and is able to respond to the research questions.

The instrument design and the process of measuring the constructs will be presented in the next chapter. In order to complete the picture of the methodology, the sample process of collecting data is one of the essential parts to be considered associated with research methodology procedures. Therefore, the next section will identify the various types of sample techniques and justify the suitable sample technique used in this research.

6.4 SAMPLING

Sampling can be defined as the, "Process of obtaining information from a subset, a sample of a large group (the universe or population)"(McDaniel &Gates, 2001, p.38). Mendenhall *et al*. (1971) defined a population as the totality of units or people about whom the researcher needs to obtain information. More specifically, a population is seen to be a complete group of people that constitute a community, a society, an organisation or anything that may have some common characteristics or criteria. In addition, Selltiz *et al*. (1981) view a population as the aggregate of the cases that conform to some shared specifications. The specifications are determined by the goal of the research. Therefore, the term 'population' refers to the entire set of people or things that the researcher aims to examine.

6.4.1 TYPES OF SAMPLING

Sampling techniques fall into broad categories, namely, probability and non-probability sampling. The probability sample is based on chance and random selection procedures. In probability sampling, every element in the population has a known non-zero probability of being selected. The selection of a probability sample will always respect certain statistical rules that are not subject to the interference of the researcher (Sekaran, 2003). Due to its randomness, the probability sampling procedure eliminates the bias associated with non-probability sampling (Zikmund, 1999). One of the advantages of using probability sampling is that it allows the sophisticated use of statistical tests to search for group differences. There are four types of probability sampling methods: simple random sampling, systematic sampling, stratified sampling and cluster sampling (Remenyi *et al*., 1998). The study adopts simple random sample technique to collect the data, the rationale for this is described below.

6.4.2 SIMPLE RANDOM SAMPLING

This type of sampling gives all units of the target population an equal opportunity of being selected as subjects. Simple random sampling has the advantage of sampling selection, which comes only after a listing of the whole population before the sampling procedures begin. A major disadvantage of this type of sampling is that it is usually impractical to target all the population (Sekaran, 2003).Although, various different processes and techniques can make it complicated to adopt (as mentioned above) there are two types of sampling, namely, probability and non-probability. Each has various techniques, which can assist in reducing the difficulty involved in their choice. According to the nature of the study, it is possible to match the technique that suits the research. The most appropriate sampling technique is probability sampling, which is considered for this study. This is because of its ability to obtain unbiased and reliable estimates of the mean value of the parameters used in the research. Further, it is based on the capability of a given chance and the randomness for each member of the sample population to participate by covering a broad area and large number of people. On the other hand, the non-probability technique is usually used when the sample population is small and it is not possible to specify the probability of each unit in the sample. There will no chance for each member of the sample population to be selected to participate. Therefore, the second sampling method is inconsistent with the purpose of this research as the study seeks to involve a large group of the population by giving a chance for anyone who wants to participate. With this boundary of probability in mind, simple random sampling was adopted to collect the target data. The rationale for this selection is because this type of technique is unbiased and easy to demonstrate. Further, it gives a chance for randomness for the participants being selected.

This technique does not need to divide the population to groups, rather only list the places to be surveyed. This sampling technique allows the members of the population to be chosen independently of each other (Sekaran, 2003).

6.5 CHALLENGES OF THE RESEARCH TOPIC

The literature review presented in chapters two, three and four revealed that there is a lack of previous research into the key aspects that this study require to conduct as described in chapter one. The literature illustrates a general lack of knowledge surrounding the key factors that influence students to use VLEs and how these factors are addressed and managed by an education system in a country, such as, Libya. Any relevant IS literature is based on personal experiences and is centred upon two studies that investigate acceptance in a context that is similar to this research. One problem with IS conception, such as, VLEs, is with its adoption. Even with the best of situations and the many levels of knowledge and systems available, VLE adoption commonly fails without clearly understanding the factors that might help to encourage users to adopt it (Al-Gahtani, 2008; Venkatesh, 2000).The understanding of the VLE concept and its acceptance is widespread in Western countries (see Table 3.1) but unfortunately, the requisite knowledge and capacity for its introduction and implementation are rarely found in developing countries, such as, Libya. In the education sector in Libya, it has become evident that no comprehensive or empirical studies of VLE acceptance or adoption deployment have been carried out. This particular challenge has influenced the choice of this study, even though Swesi (2008) has conducted a study in a similar area to explore the robustness of the Technology Acceptance Theory. As a way of leading a study of this kind, this research has constructed a model, labelled a ‘VLEAM’, for the adoption of a VLE in Libya. This model may prove suitable for other applications that seek to identify possible options to ensure a smooth implementation of a VLE framework into the education sector in Libya. The model was conceived during the course of this study for the adoption of VLEs based on factors related to IS research. Thus, the central objective of this research is to develop a conceptual customised VLE model for the Libyan higher education sector. This requires identifying the reliable factors deployed in the model, as discussed previously in chapters three and four. In order to study the critical factors for effective VLE adoption in the Libyan education sector, the researcher deemed a descriptive approach to be appropriate (Davis, 1989). Rather than making certain risky generalisations regarding perfect knowledge and judgement of the respondents, the descriptive approach helps to describe the detailed variation in a situation from an individual, organisational or any other perspective (Sekaran, 2003). Therefore, a descriptive approach in the context of this study involved all students from different specialisations (all schools and departments in the university included) to investigate the effect of the specialisation construct and to ensure that different departments were involved. This approach involved three different levels of inquiry:

- the ‘what’, which are the factors that influence the process of using VLEs
- the ‘how’ factors, which can be employed in the model
- the third level, an understanding of the issues of leaning styles that have the potential to affect VLE usage is considered. This necessitated a multi-level enquiry to examine problems associated with the research topic.

A useful tool for this purpose is a quantitative survey. The survey was adopted from previous studies with little change made for the different research place and culture. In order to construct a generic model for VLE adoption in the Libyan education sector, this research employed an adapted version of Davis's (1989) theoretical model to investigate attitudes toward using the system. Davis's model was modified by introducing and conducting three levels of inquiry to reflect the problems that emerged due to the nature of the topic and the aim of the study. These three levels of inquiry involve identifying the critical factors that maximise the influence of users and their understanding of the process of adoption.

Level One: In order to investigate the attitudes toward using the VLE system, the Technology Acceptance Model (TAM) was one of the models used to study the adoption or underutilisation of this type of technology. Thus, TAM is used as a tool and for the base of the research model as described in previous chapter (Figure 5.1).This involved the use of Belief, Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Attitude Towards Use (ATT), and Behavioural Attention to Use (BI) constructs.

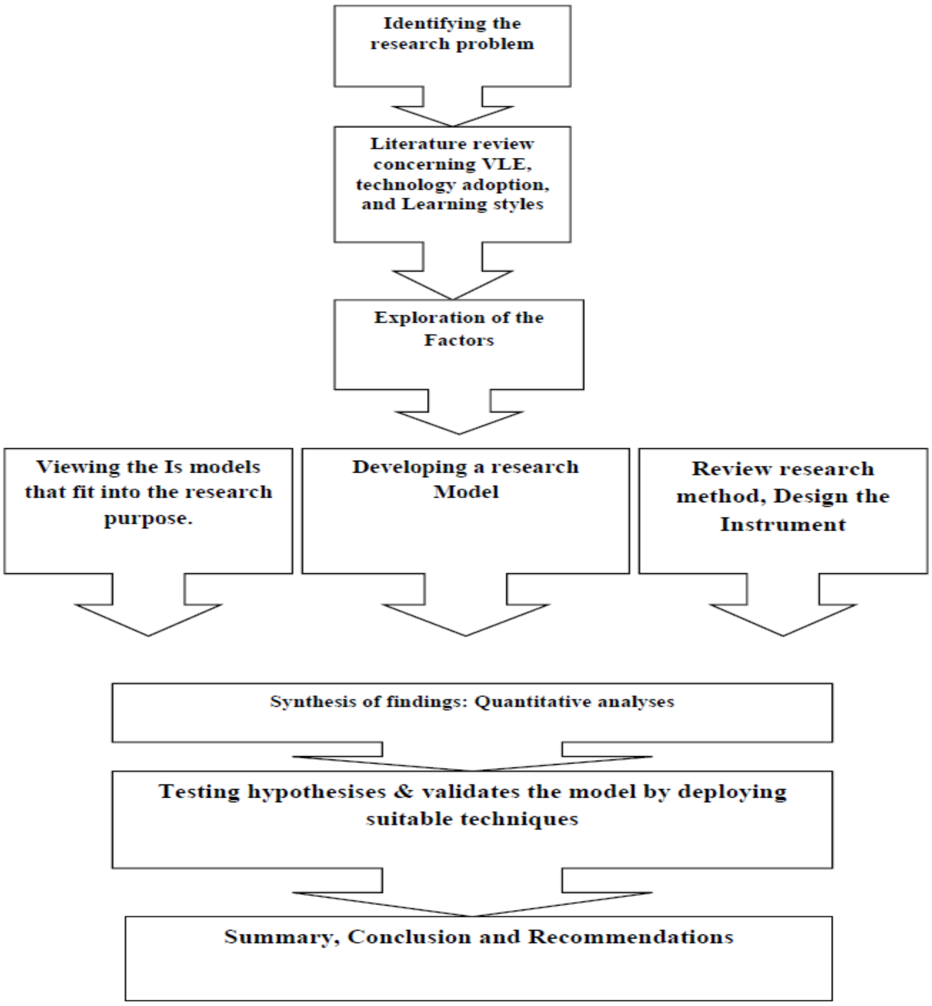
Level Two: This level incorporated seven external variables. These variables represent independent factors that may play a significant role in understanding attitudes toward using VLE as well as increasing their variance. These factors are very important and require consideration. They were described in chapter three as external constructs that influence PEOU and PU in a large sample in order to counter the limitations of previous studies. These factors include gender, subjective norms (SN), job relevance (JR), self-efficacy (SE), experience (EXP), complexity (CX) and specialisation (SP).

Level Three: In order to answer the research question about the attitude to use VLE systems, this is believed to depend on students' preferred learning styles. Learning styles is an important factor and are based on the definitions discussed in chapter four. The researcher has combined the learning styles model with the base model of the TAM to produce the VLEAM research model to assist this investigation, as discussed in chapter one. This model may be able to measure the level of acceptance of VLEs.

6.6 PLAN AND ANTICIPATED OUTCOMES OF THE RESEARCH

The research design is concerned with the research to be conducted, the type of investigations carried out, the sample and means of data collection and analysis. The research methodology developed for the study of VLE acceptance and adoption in Libya University incorporates a quantitative method, as illustrated in Figure (6.2) This clearly integrates the findings of the quantitative analysis. Figure (6.2) shows the plan, which the researcher has developed in order to carry out the investigation for this research study.

Figure 6-2 Plan and outcome of the research



6.7 CONCLUSION

The aim of this chapter was to provide a justification for the research methodology adopted for this research. The chapter started by presenting the purpose of this research which believed to assist in underpinning the appropriate methodology. The chapter provided a brief discussion on the main and popular paradigms namely, positivism and interpretivism used by IS research, along with their philosophical assumptions.

Accordingly, the chapter provide the two most popular research methodologies quantitative and qualitative. Consequently, this research concluded that the choices of positivism and the quantitative research approach to be the most appropriate approaches that for guiding this research.

In addition, the chapter identified the various research methods that were available, especially those previously used in IS research. Although, the case study was considered as a second method in the domain of IS research, particularly to investigate the adoption of technology,this method, is usually reserved for use at an organisation's level. As this research sought to investigate the phenomena at the individual's level. It concluded that a survey questionnaire was more appropriate. In addition, it is the leading research method in IS research and, is therefore justified for deployment in the current study.

The chapter discussed available sampling techniques. Ultimately, simple random sampling was adopted for this research. Thus, having concluded the choices for the research methodology, strategy, research method and sampling techniques the next chapter will discuss all the relevant issues that relate to the research's design and how the design guided the inquiry to realise its objective.

7 RESEARCH DESIGN

7.1 INTRODUCTION

The previous chapter described the research methodology and its underlying assumptions that guide the present research. A justification for the adoption of positivism as the paradigm and the use of a quantitative approach as a research strategy was offered. Arguments were also offered to justify the selection of a survey as a suitable research method that used a paper-based questionnaire in order to collect the required data to validate the research model and respond to the research questions.

This chapter complements the previous one. It continues to discuss various issues associated with the research's design in order to complete the picture of the research methodology. The current chapter aims to discuss the required procedures and draw guidelines for the empirical study. The chapter commences with a description of the research's design and topology. This is followed by a discussion concerning sample selection. The chapter continues by arguing that the research instruments designed and introduced for use in this research originate from previous validated pioneer studies. These instruments were used to measure the constructs of the research model. The chapter moves on to describe the translation process of the instrument into the participants' own language (Arabic) to ensure that the instrument is understandable and completed accurately. The chapter continues with an overview of the research's ethical concerns including how participant confidentiality was ensured. The pilot study is next described showing how the process was undertaken to ensure the reliability and validity of the research instrument. The chapter continues with a description of the physical processes involved in the actual collection of the data, including how the survey was distributed and introduced to the participants.

7.2 RESEARCH DESIGN

The rationale behind every research design is provided to ensure that evidence obtained produces a concrete solution to a particular research problem. Bryman (2001) stated that research designs serve as the backbone for any study, providing the operational framework within which a particular research study is planned and executed.

The research design is perhaps the strongest component of the concept of research method. Whilst the former acts as an overall framework of the study and provides a logical structure of the enquiry, the latter deals with the techniques used for data collection and analysis (De Vaus, 2001; Smith, 1998).

7.2.1 TYPOLOGY OF RESEARCH DESIGN

A conventional distinction has been made within the social sciences between pure (basic) research and applied research. In simple terms, basic research is concerned mainly with theory-building, whereas applied research is directed towards practical use, however, these two types of research are compatible and can never be totally separated (Bryman, 2001; Gilbert, 2001). Indeed, there are many ways social research strategies can be classified depending upon different perspectives.

In rendering an account of the outcomes of research, any research method, quantitative or qualitative, must depend on either a descriptive or an explanatory approach. The type of approach will depend on several determining factors. A descriptive study aims to identify the basic substantive analysis of what is being studied. Hence, the methodological language is rendered in descriptive form, setting out to collect, organise and summarise information. On the other hand, an explanatory approach goes beyond simple description, in that it seeks to discover relationships between variables, probing how and why correlations exist between those variables. It focuses hypothesis testing to produce inductive conclusions to make empirical sense of the social phenomena being invested (Cresswell, 2003; Erickson & Nasanchuk, 1992; Smith, 1998).

A determining basis for the classification of research design is the amount of control the researcher exerts over the variables and the research situation. There are three types of research classification from this perspective: experimental, longitudinal and non-experimental studies. Experimental and longitudinal designs are usually used in the physical sciences. These are unique for their experimental method, which aims to control the variables and the research situation. Experimental and longitudinal designs share common goals of measuring change over time by collecting data on a minimum of two different occasions (Cresswell, 2003).

Conversely, however, non-experimental design—also known as a cross-sectional design—involves the collection of data within a given time frame. This is based on measuring the difference of specific variables at one point of time rather than variable. Therefore, the analysis of the cross-sectional data requires data from multiple cases using the same variable. These data can be collected using several means of data collection commonly used in both qualitative and quantitative methods, namely survey, case study, interviewing, etc. Moreover, the non- experimental designs can be used for all or each of the descriptive and or explanatory studies (Cresswell, 2003).

The researcher concluded having discussed the above issues, that the design of this research should be considered non-experimental. Therefore, the next sections will identify all the procedures that need to be followed, in order to comprehensively fulfil the research's objectives and respond to the research questions. These procedures include sample selection, questionnaire design and administration, operation and measurement constructs translation of the instrument, ethical issues, target respondents and participants, and the pilot study. It is relevant at this point to present the research questions that need to be answered. This will assist the design of the research. The next sections commence with research questions and then continue to describe the required procedures.

7.3 RESEARCH QUESTIONS

Researches always seek to unravel mysteries; that is, they try to shed light on ‘problems’ affecting society. Seckaran (2003) defines a problem as any situation where a gap exists between the actual and the desired ideal state. Nachmias (1996), on the other hand, defines a research problem as ‘an intellectual stimulus calling for an answer in the form of a scientific inquiry’. The research problems in this study cover the following areas:

- What are the perceptions of the students, their attitude toward, and behavioural intention to use, Blackboard’s Course Management System (BCMS), based on their learning style?
- What are the roles of specialisation construct and the impact of learning style on acceptance of new technology (VLE) amongst Libyan university students?
- Are there any significant relations between gender group and learning styles?

The problem in this research will fill the gap existing in the previous studies amongst IS research as learning styles are the main factor (main topic). Owing to that fact, attempts are made to narrow the understanding of the relevant factors that may assist the adoption of the system by the perspective of Libyan students, which have been discussed in chapter one. In order to investigate the research purpose, the researcher discussed the sample selection to be targeted in this study. The next section will present the sample selection for this research.

7.4 RESEARCH SAMPLE SELECTION

This study has focused on the attitude and the behaviour intention of university students towards using new technology (VLE), rather than upon the functionality of the system. This provides a basis for selecting the research sample. University students who were considered suitable for participation were assessed according to a single precept. According to the research’s model (VLEAM) the acceptance and adoption of VLE is best investigated via actual and target users i.e. mainly students or staff (Venkatesh, 2000). This involves identifying Libyan universities, which have installed this type of technology. The selection process is influenced by the following criteria.

The first criterion is that target universities must be found within the Libyan higher education sector. This excludes private institutions and the non-education sector, such as, agriculture, industry and construction, This choice is informed by the need to narrow down the focus of analysis to a single sector. It is the researcher’s opinion that, if the focus of analysis is narrowed, the outcome of the study could be contextually and practically understandable, since education sector (universities) operate in the same environment in Libya.

The second criterion involves the selection of a particular education sector, which is the same in terms of its users, maturity of VLE adoption and scope of business. The rationale for this is that these universities have at least adopted the same technology although, at this stage, only one has adopted and installed it, namely Tripoli University in Tripoli.

The third criterion is based on previous studies that used similar technology in the same context as this research. Researchers in the field of IS, particularly TAM research, have used various approaches to sample selection. For example, Davis *et al*. (1989) used samples of students who were experienced in the use of the application. Venkatesh & Davis (2000) also used the same sample (students). Other researchers considered works as participants because they used software in their jobs, whilst others selected their sample from databases. There are a number of issues surrounding the process of selecting a representative sample of Libyan organisations (universities). These include:

- The lack of a reliable data bank listing IS research or organisations that have been involved with this kind of research in Libya. The Libyan Research Institute Organisation (LRI) is the public body that is responsible for monitoring and regulating the quality of scientific and social research. It is relatively new and is still in the process of development and its process of population is incomplete. It is not yet a reliable databank. Unfortunately this prevented the researcher from accessing data for comparative purposes. This research will be considered a primary resource for future inquiry in the country.
- There is a lack of previous research in the area of adoption and acceptance in Libya. The problem tends to adversely affect the prospects for making acceptable generalisations.
- The poor public or corporate knowledge about VLE, TAM and learning styles, has resulted in a lack of enthusiasm for this type of work in Libya.

In view of the above issues, a decision was made to target the total population in Libyan universities based on the following criteria:

- The main and popular university in the region that can help and assist the research

- The university who installed the VLE system
- As recommended by the education authority in terms of a large student body.

7.5 RESEARCH INSTRUMENT

A questionnaire-based research relies heavily on the quality of its design and administration. According to Lewis (1994), questionnaires should be aimed at collecting data, which are not already available and cannot be readily observed. Surveys are useful to obtain information as well as eliciting opinion, which would otherwise be difficult to obtain. It is worth noting, that in the context of the current research, details on VLE, TAM studies and learning styles are not widely disseminated and unavailable for public consultation. This is in contrasted with the Western world, where theories, such as, the TAM and learning styles are freely available. In Libya, this might limit student understanding the current topic of this study.

The questionnaire instrument was designed based on a seven-point Likert scale. It collected data on students' acceptance of VLE for empirical analysis. Fanning (2005) suggests identifying the domain of each related variable of the study and then develop or design items according to the defined concept. Accordingly, the selected constructs were operationalized using validated items from the previous research studies.

The questionnaire used in this study included validated items adopted from prior TAM research (Davis, 1989; Venkatesh & Davis, 2000; Chau, 1996; Agarwal & Karahanna, 2000; Igbaria *et al*., 1996; Igbaria *et al*., 1995; Igbaria *et al*., 1997; Legris *et al*., 2002). The second part of the questionnaire used Kolb's (2000, 2005) learning styles inventory (LSI) version described in chapter four in its original form and without any changes.

The instrument was divided into three parts and more details about the design and operationalised the constructs will be described in the following sub-sections.

7.5.1 OPERATIONALISE AND MEASUREMENT OF THE CONSTRUCTS

The study divided the measurement of the constructs into three parts, which described in following subsections. The first part includes the demographic data, whilst the second part is TAM constructs and the external variables (antecedents) included in the model derived from prior technology adoption studies, and the third is Learning Styles Model, as derived from Kolb (2000, 2005).

7.5.1.1 TAM constructs

Perceived usefulness was operationalized using items adapted from Davis *et al*., 1989, Chau, 1996 and Al-Gahtani, 2008. The statements of perceived of ease of use was adapted from Davis *et al*., 1989; Chau, 1996. An attitude towards use scale was adapted from Davis *et al*., 1989; Agarwal & Karashanna, 2000. The behavioural intention to use was operationalised using a scale adapted from Chau, 1996; Davis *et al*., 1989 Table (7.1) shows the concepts and how the constructs were used for the purpose of measurement. The items were validated and satisfied the criteria of reliability.

Table 7-1TAM constructs measurement

Constructs	Concepts	Questions (Items)	Adapted From
Perceived usefulness (PU) of the VLE	Measures capability to perform tasks more quickly, improve productivity and enhance efficiency when using the VLE.	1. Using the VLE can allow me to accomplish tasks more quickly 2. Using the VLE can improve my performance 3. Using the VLE can make it easier to perform my study 4. Using the VLE in my study can increase my productivity 5. Using the VLE can enhance my effectiveness 6. I find the VLE useful in my school	Davis *et al.*, 1989, Chau, 1996, and Al-Gahtani, 2008
Perceived ease of use (PEOU) of VLE	Measures ability to learn the use of the Internet more easily, obtain a desired job when needed, become skilful more easily, and acquire flexibility in using the VLE.	1. It is easy for me to learn how to use the VLE 2. I find it easy to get the VLE to do what I want it to do 3. Interaction using the VLE is clear and understandable 4. I think interaction is flexible using the VLE 5. It is easy for me to become skilful when using the VLE 6. The VLE is easy to use	Davis *et al.*, 1989, Chau, 1996
Attitude towards use (ATT) of the VLE	It measures positive or negative feelings of acceptance towards VLE use, the attitude of interacting with the VLE, and enjoyment when using the VLE.	1. Using the VLE in the university is a good idea 2. Using the VLE in the university is a wise idea 3. I like using the VLE in my study 4. I find a lot of enjoyment when using the VLE 5. I enjoy using the VLE 6. Using the VLE satisfies me	Davis *et al.*, 1989; Agarwal & Karashanna, 2000
Behavioural intention to use (BI) the VLE	Deals with current use and planning to use it in future. The scale was adopted from Chau (1996) and Davis *et al.* (1989), with some items adopted from Venkatesh & Davis (2000).	1. I always try to use the VLE to undertake tasks whenever it is relevant 2. I always try to use the VLE as much as possible 3. I will use the VLE during my study 4. I intend to continue using the VLE 5. I have the desire to continue using the VLE 6. I expect my use of the VLE to increase in the future	Chau, 1996; Davis *et al.*, 1989

7.5.1.2 **External variables (Predictors of PU & PEOU)**

The external variables included in the conceptual model will be measured using previous and validated research. Table 7.2 describes the concepts and the authors.

Gender was measured as a single value either 1 for male or 2 for female as used by Gefen & Straub (1997). Subjective norms were operationalised using a scale adapted from Taylor & Todd (1995), which was later developed by Venkatesh & Davis (2000). A job relevance scale was adapted from Venkatesh & Davis (2000). Items to measure self-efficacy were adapted from Gist *et al*., 1989 and Compeau & Higgins (1995). Specialisation construct was adapted from Swesi (2008). Perceived complexity was operationalised using items adapted from Igbaria *et al*. (1996). Finally, the measurable items regarding experience were adapted from Venkatesh & Davis (2000). The following table show the concept of each construct and the author from whom it was adapted.

Table 7-2Antecedents of PU & PEOU

Constructs	Concepts	Questions (Items)	author
Gender	Measured as a single item, as will take value of 1 male, and 2 female.	Gender:	Adopted from Gefen & Straub (1997).
Subjective norms (SN)	Represent the degree to which students perceive that people important to them believe that they should use the VLE and its functions for the purpose of their education	1. People who influence my behaviour think that I should use the VLE in my study 2. People who are important to me think that I should use the VLE in my study	Taylor & Todd (1995), as later developed by Venkatesh & Davis (2000).
Job relevance (JR)	Measuring the application that be used by users if it is relevant to their jobs or it is will be related to the job.	1. The VLE is very important for my study 2. The VLE is relevant to my study	Venkatesh & Davis (2000).
Specialisation (SP)	Used single item to indicate the specialisation of VLE users.	Specialisation:	Swesi (2008)
Self-efficacy (SE)	Users' beliefs about their ability to use the VLE proficiently; the construct measures the use of VLE the capability without any help from others.	1. I expect to become very proficient in use of the VLE 2. I feel confident that I can use the VLE 3. Using the VLE is probably something I will be good at 4. I believe that surfing the Internet is a skill I can easily use 5. I could complete the study using the VLE, if someone else had helped me get started 6. I believe that my VLE skills will improve substantially through training	Hollenbeck & Brief (1987) and Chau (2001), (Bandura, 1986; Gist *et al*., 1989; Compeau & Higgins, 1995).
Perceived Complexity (CX)	Measures the amount of time needed to perform the job and the difficulty of updating previous work when using the VLE, it is opposite to ease of use.	1. Using the VLE can take up too much of my time when performing many tasks 2. I find it difficult to integrate using the VLE into my existing study 3. Using the VLE exposes me to the risk of computer breakdowns and loss of data	Igbaria *et al*. (1996).
Experience (EXP)	Operated as they recommend by Venkatesh & Davis, measuring perceptions of using the VLE and years of experience in doing so. These measures and scales have high reliability in previous studies.	1. I have a great deal of experience of using the VLE	Venkatesh & Davis (2000)

It is worth noting that for the specialisation construct, the study established three groups as described in Table (7.3). Each group was characterised by various specialisations, which are based on the academic disciplines referenced from a recognised website (www.answers.com/topic/list-of-academic-disciplines). The study classified the academic departments into three groups. Each department catered for specialisations referred to by the website mentioned above. The rational for categorising only three small groups was to make the analysis easier and for statistical purposes.

Table 7-3Specialisation groups

Source: www.answers.com/topic/list-of-academic-disciplines

Group name	Specialisation included
Natural and Formal science	Space science, earth science, life science, chemistry, physics, mathematics, computer science, and engineering.
Profession and applied science	Business, education, law, health science, journalism, media, communications, agriculture and forestry science.
Social science and humanities	Anthropology, economics, psychology, sociology, political science, geography, history, philosophy, religion, languages, architecture, design and applied arts.

7.5.1.3 Kolb Learning style model (LSI)

The researcher employed the instrument without making any modifications as used by Heffler (2001) and Kayes (2005). These researchers confirmed the reliability of the version. The LSI is highly regarded and has been adopted by many organisations, businesses and educational institutions. It is designed to measure the degree to which individuals exhibit their own learning styles based on experimental learning theory (Naser-Nick, 2009). The LSI requires students in this study to decide upon the tension between the types of Kolb learning styles. Therefore, the format of the LSI questionnaire asks students to rank-order their preferences. Table (7.4) describes the construct of learning styles concepts and previous authors that adapted this questionnaire. The LSI shown in Table (7.5) comprises 12 questions. Each question has four words (items). A student is required to rank order each set of four items without having any ties, in order to describe their learning style.

Table 7-4learning styles LSI

Constructs	Concepts	Questions (Items)	author
Learning Styles LSI	Learning style as how information is processed, as well as how it is perceived.	See the table below	Kolb's LSI Version 3, Heffler, 2001; Kayes, 2005

The Table (7.5) is a 12 item self-description questionnaire. This questionnaire describes the four different learning approaches as follow:

Concrete experience (CE) → feeling
Reflective observation (RO) → watching
Abstract conceptualisation (AC) → thinking
Active experimentation (AE) → doing

The participants were asked to rank-order four words in each column, which he/she feels best describe their own learning style. In each of the 12 items, the participants were required to provide one answer by assigning numbers from 1 to 4 as **4**= most like you, **3**= second most like you, **2**= third most like you, **1**= least like you, and so on until the end. As an example, assigning 4 means best characterises his/her learning style and 3 means next best characterises his/her learning style. The participant may find it difficult to choose among the four choices that best represent his/her learning style but the instructions provided by the author advise the participants that there is no wrong or right answers, therefore, all choices are equally acceptable. The purpose of the questionnaire is to describe how the participant learns, rather than to evaluate the ability to learn.

Table 7-5Learning Style Inventory (LSI)

Source: Kolb (2005) Version 3

4= most like you, **3**= second most like you, **2**= third most like you, **1**= least like you

no	Items	A		B		C		D	
1	When learn		I like to deal with my feelings		I like to think about ideas		I like to be doing things		I like to watch and listen
2	I learn best when		I listen and watch carefully		I rely on logical things		I trust my hunches and feelings		I work hard to get things done
3	When I am learning		I tend to reason things out		I am responsible about things		I am quiet and reserved		I have strong feelings and
4	I learn by		Feeling		Doing		Watching		Thinking
5	When I learn		I am open to new experiences		I look at all sides of issues		I like to analyse things, break them down into their parts		I like to try things out
6	When I am learning		I am an observing person		I am an active person		I am an intuitive person		I am a logical person
7	I learn best from		Observation		Personal relationships		Rational theories		A chance to try out and practice
8	When I learn		I like to see results from my work		I like ideas and theories		I take my time before acting		I feel personally involved in things
9	I learn best when		I rely on my observation		I rely on my feelings		I can try things out for myself		I rely on my ideas
10	When I am learning		I am reserved person		I am an accepting person		I am a responsible person		I am a rational person
11	When I learn		I get involved		I like to observe		I evaluate things		I like to be active
12	I learn best when		I analyse ideas		I am receptive and open-minded		I am careful.		I am practical.

Each learning style is calculated by accumulating the twelve responding questions, as described by the Kolb (2000). In order to find a specific learning style for each participant, the numbers must be taken from each column and added together as described in Table 7.6.

The four learning styles CE, RO, AC, and AE must each have twelve values and then the total of each learning style is calculated. For example, CE total equals the values of each participant's choices, i.e. (1A) A means the first column and 1 means the first row (bit of the grid), another example, (8D) D means the fourth column and 8 the eighth row. Kolb (2005) recommended this process.

Table 7.6: Calculation of LSI

CE Total=	1A+2C+3D+4A+5A+6C+7B+8D+9B+10B+11A+12B
RO Total=	1D+2A+3C+4C+5B+6A+7A+8C+9A+10A+11B+12C
AC Total=	1B+2B+3A+4D+5C+6D+7C+8B+9D+10D+11C+12A
AE Total=	1C+2D+3B+4B+5D+6B+7D+8A+9C+10C+11D+12D

7.5.2 QUESTIONNAIRE STRUCTURE

Oates (2006) states that questions employed in questionnaires must motivate the respondent to provide the information that is required. The major considerations involved in formulating questions are based on the following factors.

Structural: The structural outline seeks to enquire about the kind of information we seek from each question, to notice the data flow and the number of questions required to do that and the order and consistency of these questions.

Design: Each question is written carefully to enquire about an exact issue to facilitate respondent understanding and, therefore, improve response rate.

Wording: The use of language must be clear and unambiguous.

According to the instrument described in a previous section, the questionnaire was divided into three parts (see Appendix C). Part one is demographic in nature, which has been designed to collect information concerning gender, education level, years of study (Year 1, Year 2, etc.), specialisation (major) and the year of using VLE. Part two is the TAM's core constructs and its antecedents (external variables) adopted by previous validated studies as described in a previous section. Part three is the learning style instrument (LSI) in its original form.

The merits of a questionnaire for this kind of research need emphasising. The topic of this research is believed to be new. Therefore, in considering this the researcher fully informed the participants about the subject under investigation to ensure the research instrument will be understandable before asking them to answer the questionnaire. One way to cover this issue is collect the data physically.

There are two ways of delivering/receiving a questionnaire, namely, by Email or physically handed over (paper-based questionnaire) (Fanning 2005). The email option is relatively low-cost and convenient and allows the respondents to complete the questionnaire in their own time. The researcher, however, decided to collect the data physically using a paper-based questionnaire on the university campus. The rationale for this decision is as follows:

1. The topic is innovative. This has been learnt from previous experience; therefore, it is necessary to describe directly all the relevant information that the participant requires to successfully complete the questionnaire.
2. The adopted terms that represent the items may confuse some participants, for example, usefulness items, self-efficacy and complexity constructs. The exact

meaning of such terms need to be explained in the participant's own language or provided with alternative vocabulary to ensure that the survey is understandable and completed in a way that reflects their feelings.

3. As the learning styles (LSI) questionnaire is new and introduced for the first time to Libyan students, it may lead to misinterpretations by the participants due to the scarcity of relevant information available for this kind questionnaire in Libya. This was observed when the researcher presented the instrument to the DMU Arabic students and when he was investigating the reliability of the constructs at that time.

7.6 INSTRUMENT TRANSLATION PROCESS

As mentioned earlier, the target participants of this research are Libyan students using VLE whose native language is Arabic. The researcher conducted a literature review in order to search for previous validated instruments, which had been used in a similar area of research. A study conducted by Al-Gahtani (2008) and Al-Gahtani *et al.* (2007) was found. The researchers tested the applicability of the TAM model in the Arabic context. Based on the Arabic translation, the part that concerned the TAM core constructs was adopted by this study.

Other factors, such as, social factors, experience and self-efficacy were adopted from a study (an Arabic version) conducted by Shanab and Pearson (2009). They used an Arabic instrument validation process to investigate Internet banking in Jordan. The process involved a focus group of Arabic speakers from the field of education. This focus group cooperated in the translation. In the next stage, the researchers sent the Arabic version to linguistics experts to comment and give feedback. This study adopted the translation of these constructs and reviewed it again with a focus group established at De Montfort University in the UK (DMU). Other factors, such as, job relevance and complexity was also translated by our focus group at DMU.

Extensive research was done to locate an Arabic version of Kolb’s Learning Styles Instrument (LSI).However; an Arabic version could not be found nevertheless the literature is full of other learning styles models.

The following process translated the instrument’s format for this research. First, the translations of the TAM core constructs were adopted from previously validated instruments. Apart from the adopted translation, the researcher used a focus group of Arabic students (PhD) at the Faculty of Technology, asking them to evaluate and comment on both the English and Arabic versions to ensure that the instrument was understandable and meaningful. The learning styles instrument was translated into Arabic with the help of the academic Arabic professional who lectures at the university. The translated instrument was sent to a group of Arabic students who were engaged in linguistic studies at Exeter University to review the accuracy of the translation and the interpretation of the terms that were used, as well as to evaluate its overall quality. Finally, comments were invited from an experienced lecturer in the area of linguistics. He was asked to assess the whole instrument and back translate it from Arabic to English to ensure a consistent format. The professional confirmed there were no major discrepancies. The final Arabic version of the questionnaire was ready for the pilot study to measure and establish its reliability and validity.

7.7 ETHICAL CONCERNS

It is very important when conducting any research to consider ethical aspects. Therefore, in order to carry out fieldwork, such as, deploying surveys and to comply with the requirements of the research, a certificate of ethical approval was obtained from the Human Research Ethics Committee of the Faculty of Technology (see Appendix E).

The researcher asked the permission from the Vice Chancellor of Tripoli University to use classes for collecting data for the purpose of the research. The permission was granted (see Appendix F) before the data collection process was carried out. This permission was required in order to execute two purposes: first, a place to advertise the research and second, to allow the researcher to survey participants from different schools to ensure major departments were included.

Consent for students' rights was attached with each questionnaire. It described the purpose of the research and asked participants to agree to complete the survey and confirm that they were fully aware of their rights. Participants were informed that the researcher has the responsibility to protect their confidentiality. This consent was agreed with students that will exclude the following:

1- Respondents' co-operation in this research is voluntary; it will not include personal information, such as, names, numbers or contact address.
2- The information will be kept in confidence unless the participants need the results of the research. In case of this eventuality, the researcher provided a contact address.
3- The respondents will not be misled when asked for their co-operation.
4- The participants have been informed and ensured that information will not be used for any non-research purpose.
5- The participants have been informed that will not be victimised, harmed or adversely affected because of their participation.

7.8 TARGETED RESPONDENTS

The researcher issued 500 questionnaires. Fifty questionnaires were distributed to each school and department to ensure all specialisations (majors) were included to answer the research question comprehensively. The assistant staffs have the choice of selecting one class of their departments, and he has self-determination of the choice that he feel ready to participate. Students were selected on the basis of the assumption that they were most likely to be best informed about using and already advised by educators to use VLE and follow the policy and the process of adoption of VLE within their schools.

7.9 RESPONSE TARGET

One of the lessons learned from the researcher's previous study is to maximise the response rate. A number of factors can be used to increase the response rate to a questionnaire (survey). These include, the nature of the topic, the sample size, timing of the survey, the length of the questionnaire and the manner by which the particular survey is conducted (May 2001). The common challenges, therefore, are associated with survey. Conventionally, a survey should be dispatched at a time when respondents are likely to be available and this can be influenced by the researcher's schedule and time constraints. In this study, questionnaires were administered in December 2009, at a time when the majority of students were available and not on holiday. At that time of the year, a Libyan university is considered to be in the middle of Semester One with students and staff fully engaged in their daily academic activities. Thus, the majority were involved using VLE as part of the education system, such as, interacting with materials. Of the 500 questionnaires distributed, 410 were collected with a response rate of 82%, of which 12% were unusable. Of the 410, 302 were usable and fully answered, whilst 62 responses were incomplete, 7 were half completed and the remaining were not considered owing to student lack of understanding of the questionnaire. Of the 302 questionnaires, which were adequately completed and ready for analysis, this number of completed questionnaires were used in the analysis described in chapter eight, the effective response rate was 81%. This was deemed acceptable for a survey of this kind. This response rate, however, may be considered a limitation. It might be that the topic is new to students, which may have reduced the response rate.

7.10 PILOT STUDY

In order to maximise positive outcomes**,** a pilot study was conducted. A pilot study is normally used to detect weaknesses in questionnaire design in terms of validity, reliability and practicality (McDaniel & Gates, 2001). Cohen *et al*. (2001) added that a pilot study aims to establish constructs reliability to guarantee that the items are unambiguous.

Due to time and financial constraints, the pilot study was conducted in the UK, not in Libya. Arabic and home students studying at DMU acted as the pilot population. This arrangement was agreed with the supervisory team.

The procedure

Before proceeding to the main study, the researcher tested the reliability (internal consistency) of the questionnaire. This ensured its reliability and validity, as recommended by Szajna (1996). Szajna stated that a pilot study should be conducted to assess the content, construct validity and reliability of the measure before being distributed amongst participants. The aims of conducting reliability and validity tests for this study are:

- To validate the instrument
- To detect any ambiguous questions that may confuse the participants

- To check the time taken to complete the survey
- To obtain some recommendations that may help to re-structure the survey from the students' points of view
- To evaluate the answers of the participants.

The researcher organized a session of postgraduate students (PhD students) in the school (Centre for Computing and Social Responsibility (CCSR)) inviting them to complete the questionnaire. The focus group was divided into two, each one consisting of three participants who were asked to comment and discuss the questionnaire and provide any feedback. The feedback should cover the points described above. Feedback was obtained from the groups having considered the following: question ambiguity, accurate of questions, identical translation, question understanding, format of scales, time of complete and sequence of questions. The supervision team reviewed all the feedback comments and a few modifications to the instrument were recommended, particularly to items that were ambiguous.

The pilot study was conducted at DMU, UK, using both English and Arabic versions for both Arabic and home students to ensure the questionnaire was reliable. This was another lesson learned from the researcher's previous study. Although, Arabic students were able to use English as a second language, the researcher opted to use the Arabic version, which was convenient for the respondents. The pilot study was conducted on a sample of Arabic (15) and home (10) students; the total was 25 questionnaires, which were printed and handed to the students, all of whom agreed to complete the survey. The majority of the respondents took between 10 and 20 minutes to complete the survey. The researcher remained with the Arabic students, the majority of whom were studying a Master or PhD course in the UK, whilst the remaining were BSc students studying at DMU. The questionnaires were then collected from the students to ensure the questionnaire's items were clear, unambiguous and appropriate for the actual study. In October 2009, all the samples were entered into the SPSS software to analyse their reliability and validity and to ensure the questionnaire was ready for the actual study. The next section describes the analysis of the pilot study.

The pilot study was conducted in several stages. Firstly, the pilot questionnaire was tested to generate data to assess its reliability and validity. Validity and reliability are described in the next section. The pilot study involved the student sample, the research supervisors and advice from two experts in quantitative research from DMU University. In addition, two experts based in Libya who served in academic positions in the Department of Business Management in Libya University (University of Tripoli) were contacted via e-mail to give their feedback on the questionnaire. Secondly, the majority of feedback was positive and only minor modifications were required, which were agreed by the supervisory team. Thirdly, the validity and reliability of the two versions (Arabic and English) of the modified questionnaire were assessed after re-testing. The next section describes the processes involved in assessing validity and reliability of the questionnaire. The supervision agreed to the final version. The questionnaire was subsequently ready for distribution.

7.10.1 RELIABILITY AND VALIDITY

When the final version of the questionnaire had been agreed, the validity and reliability of the data collected had to be considered. Reliability and validity is associated to the degree to which the research instrument is free from error (Carmines & Zeller, 1979). Some advanced researchers, however, consider reliability and validity to be multi-faceted, because various different types of the former and latter exist (Davis *et al*., 1989;

Cohen*et al*., 2001). The following sections describe the concepts and procedures used to assess the reliability and validity of the questionnaire during the pilot study.

7.10.1.1 **Reliability**

According to Venkatesh (2000), reliability is the degree of the constructs' accuracy to be used in the investigation. Similarly, as pointed out by Malhorta & Birks (2003), reliability is the technique used to measure the accuracy of the construct and to assess if the items in the construct is homogenous. Another definition of reliability is concerned with, "Whether a questionnaire would yield the same results if given repeatedly to the same respondents" (Oates, 2006, p. 277).

This may be difficult to assess because respondents may change their views over time, remember the previous feedback and simply repeat them or may even intentionally change and give the opposite view. Irrespective of any views concerning the nature of concept of reliability in quantitative research, questionnaires should be considered reliable and valid (Oates, 2006). Two different types of reliability measurement are used in quantitative research: stability (test-retest) and internal consistency (Pallant, 2001; Venkatesh & Davis, 2000). Stability reliability measurement is used to assess the consistency of factors over time and over the same sample under investigation. A reliable instrument should hold the same data for the same respondents over time. Thus, a reliable instrument will achieve the identical result when the researcher collects data using the same measure on a second occasion with the same sample under the same conditions. Internal consistency reliability is the degree to which the items in the construct are homogenous and measure the same characteristics (Malhorta & Birks, 2003). The internal consistency reliability of an instrument is evaluated by assessing to what degree its items reflect the construct and yield similar results. The most commonly used method for measuring internal consistency in quantitative research is Cronbach's Alpha (α), which can give an assessment of the average correlation amongst all the items under the construct (Winter, 2000). The value of Cronbach's Alpha's (α) range is between 0 and 1, where the higher value represents high reliability. This method has been used by many IS researchers (Davis *et al*., 1989; Kolb, 2000; Heffler, 2001). Notably, a Cronbach's Alpha of 0.7 or more is considered acceptable and reliable in IS and social science research (Chau & Hu, 2001; Teo & Lim, 1996). Based on Bagozzi & Yi (1988), however, the scale measures of the constructs were considered reliable if the values of each construct were greater than 0.6. For the present research, the researcher employed internal consistency to measure the reliability of the constructs used in the research model.

The procedure

Only parts two and three of the questionnaire (see Appendix C), which refer to the constructs of the TAM, external variables and LSI were tested. Cronbach's Alpha was used to measure the reliability of the items for each construct as shown in the questionnaire (Appendix C). Table (7.7) shows the results of the reliability of the items. As can be seen from the results, all of the requirements for the internal consistency are acceptable with most items of the constructs showing a reliability range value for Cronbach's Alpha of 0.71 to 0.89. Thus, the results in Table (7.7) confirm the reliability of the instrument to be distributed for the actual study.

Table 7-6Reliability Cronbach's Alpha for constructs as pilot study results

Construct Measured	Cronbach's Alpha Values	No. of items
PE	0.819	6
PU	0.901	6
Attitude (ATT)	0.752	5
Behavioural Intention (BI)	0.898	5
Subjective norms (SN)	0.498	2
Job Relevance (JR)	0.911	2
Self-efficacy (SE)	0.76	6
Experience (EX)	A single item that was not measured	1
Complexity (CX)	0.612	3
Concrete experience (CE)	0.562	12
Reflective observation (RO)	0.75	12
Abstract conceptualisation (AC)	0.489	12
Active experimentation (AE)	0.677	12

Based on the above results, the only values slightly less than the requirement of 0.7 are subjective norms, complexity, CE and AE, which may be due to a small sample (25). The scale measure for each construct, however, would be considered reliable if its value was greater than that stated by Bagozzi & Yi (1988). The experts advised that this is acceptable at this stage of the pilot study and that there is no need to reconstruct or delete any items (Hair *et al*, 2006). Consequently, it can be verified that the instrument is reliable and ready for empirical work (actual study).

7.10.1.2 Validity

According to Golafshani (2003, p. 599), validity in quantitative research, "determines whether the research truly measures that which it was intended to measure or how truthful the research results are". Similarly, validity is defined as the extent to which the selected instrument measures what it is designed to measure (Carmines & Zeller, 1979). On the other hand, winter (2000) defines validity as the credibility of the inference extracted from the gathered data; therefore, validity is associated with an assessment of the quality of research. Therefore, invalid research is worthless. Undoubtedly, validity is a very important tool for effective research either quantitative or qualitative (Patton, 2002).

There are three types of validity in quantitative research: content, criterion and construct. Firstly, content validity refers to whether the questions represent a well-balanced sample of the domain to be covered. Secondly, criterion validity considers the relationships between construct score and measurable criterion. Finally, construct validity is concerned with whether the instrument measures what we think it should measure via designed questions. Construct validity, involves testing a construct or scale in terms of theoretically derived hypotheses concerning the nature of the underlying variable or construct. Construct validity is explored by investigating its relationship with other constructs both of which are related (convergent validity) and unrelated (discriminant validity). In the present research, the researcher employed construct validity, which is relevant when testing the validity of the questionnaire's constructs. The most common method to evaluate construct validity is factor analysis, which is a statistical method used to determine a cluster of interrelated variables. The factor analysis in the actual study will be described in detail in the next chapter.

Factor analysis was used in the pilot study as a test to measure the items that must represent the concepts about which generalisations are to be made (Davis *et al*., 1989). The sample in the factor analysis should be more than 100 or 10 respondents for each item to be extracted as recommended by researchers (Chau & Hu, 2001; Gardner, 2001). Despite the limited sample (25), factor analysis was performed for the pilot study to ensure validity accessibility. This, however, does not provide satisfactory evidence unless the sample is large. Therefore, the only acceptable and guaranteed validity was performed during the actual study owing to its large sample. This process will be described in the next chapter. Following the pilot study and with the questionnaire having been checked with respect to all the requirements for its reliability and validity the researcher was ready to collect empirical data from the actual study. The next section will describe how the data were collected, as well as the process adopted to distribute the questionnaire.

7.10.1.2 **Summary of Pilot Study**

The purpose of the pilot study was to examine construct reliability and to guarantee that items are clear, meaningful and consistent to ensure a relevant response from the participants. Previous studies conducted into technology adoption (Hsu & Chiu, 2004; Chau & Hu, 2001, Taylor & Todd, 1995a; Moore & Benbasat, 1991) show the sample sizes for pilot studies differ. These researchers suggest that the sample should contain between thirty to seventy-five participants. By relying on these previous studies, this study succeeded in obtaining an average of twenty-five returned and usable observations from students at DMU together with those from the focus group (PhD students at CCSR at DMU). According to Hair *et al.*,(2006) the accepted cut-off value for reliability ranges from >=0.50 to > 0.70. The results of this pilot study showed most of the constructs exceeded the threshold value of 0.70, apart from subjective norms (SN) 0.49, concrete experience (CE) 0.56 and abstract conceptualisation (AC) 0.48. This may be because of the sample size effect or that the subjective norms were not important for students because they were mature enough and were studying at Master's and PhD level. The subjective norms therefore, were not suitable for them to response meaningfully to this construct. The researcher, however, considered these values offered an adequate level of reliability and decided not modify or change the items since the questionnaire was acceptable to the students, who felt it was clear and understandable. In addition, the time was reasonable to complete the survey. As a result, it can be established that the instrument was reliable and ready for data collection for the actual study.

7.11 SAMPLING METHOD AND QUESTIONNAIRE ADMINISTRATION FOR ACTUAL STUDY

The study employed a quantitative descriptive research design using a survey adopted from two previously used and validated survey instruments. The purpose of the study is to investigate the perceptions of students in undergraduate degree programmes within Al- Fateh University in different specialisations in order to evaluate their attitudes towards accepting and using VLE technologies in their course selections, predicated by their learning style. Administrators at the university are increasing their calls for more hybrid or mixed-delivery modalities, as well as online courses to compete with regional and national rivals for prospective students and to better align the university with partner institutions.

The survey allowed the researcher to examine the students' perceived usefulness and their perceived ease of use of VLE technologies using a VLEAM model and also to examine how those perceptions are influenced by a student's gender, subjective norms, specialisation, job relevance, experience, complexity, self-efficacy and learning style (as independent variables). A survey research method was selected based on the ability of the researcher to administer the tool directly, the minimal time required by the participants to complete the survey and the rapid turnaround of data collection. As Creswell states, "A survey design provides a quantitative or numeric description of trends, attitudes or opinions of a population by studying a sample of that population" (Creswell, 2003, p. 153).

The questionnaire survey aimed to identify the perceptions of students via response to the identified group of factors employed in the research model, as described in Chapter Five. The survey was developed to produce an appropriate amount of information in sufficient detail with the aim of generating a representative list of important factors captured from a sample that represented each department in the university.

The paper-based questionnaire was written in English and subsequently translated into Arabic as previously described. It was learnt from a previous study that a number of students preferred to answer the questionnaire using the English version. The researcher, therefore, provided an English translation depending upon the request of the respondent so he/she would be able to response in his/her preferred language.

Benefitting from one of the lessons learned from the researcher's previous work, a pilot test questionnaire was carried out to test the workability and the rating system use, as well as the accuracy of the translation. Upon the researcher's arrival on campus, on the first day of the second week of December 2009, a pilot questionnaire was randomly handed to students as a means of advertising the research.

Data were collected by presenting the questionnaire to students from different departments of Al-Fatah University, Libya — the main public university in Tripoli. The data were gathered by asking the students to complete a questionnaire with the assistance of the academic staff. Based on the researcher's relationships with some of the lecturers at the target university, the researcher asked some of the staff who were working as lecturers to cooperate and assist with the research. The researcher was able to get one lecturer from each department to agree to distribute the questionnaire to their students during lessons. The researcher sent e-mails to these lecturers to inform them of when the survey would start. The second week of December 2009 was the time targeted for the survey to begin. The researcher decided to meet the lecturers to discuss all the information and instructions needed to introduce the questionnaire to the students and help the participants to complete the survey.

7.11.1 PROCESS OF QUESTIONNAIRE EXPLANATION

All the staff agreed to co-operate with the researcher after permission was granted by the Vice Chancellor to use the questionnaire on campus as well as the place of the researcher’s advertisement. The researcher requested permission in October 2009 to collect the data from the university (see appendix E). The advertisement took the form of a large poster, which included the research topic, the purpose of the research, photographs of the supervisory team and the logo of DMU. This promotion allowed the researcher to raise the profile of the research topic and its aim in order to stimulate student interest to acquire some knowledge and ask questions. The researcher found it useful to spend time with students to share information about the purpose of the research and the context of the survey. As a result, the researcher spent the first two days collecting feedback from students as a pilot study. The researcher agreed the time to distribute the survey with the staff after the advertisement had been finalised. The surveys were handed out in December 2009. This was considered a very busy time in Libyan universities during which all students are available. Each staff were handed 50 questionnaires to be collected at a later time when they feel they could carry out the task. The staff started to distribute the survey as agreed and then returned these back to the researcher in envelopes that indicated the place and department. The management and collection of data was facilitated by the researcher who had worked in the university for over 10 years and therefore had good rapport already with the staff and throughout the university. The researcher’s experience from previous studies, including the field of IS research, helped to control the process of gathering data and encourage the participants to complete the questions. With respect to confidentiality, it was discussed with the lecturers that the respondents should be volunteers also; those students who volunteered were assured that their participation would remain confidential.

Before Staff handed the questionnaires to their classes, they tried to explaining the purpose of the research and any terms used that students may feel ambiguous, giving an alternative meaning to some English terms and making sure each participant understood and was able to complete all the questions. From the feedback and opinion received by the pilot study, the researcher prepared a guidance for some terms been used in the questionnaire that considered to be confused the participates in order to make sure students will accommodate the questions, the following are some terms described to students:

Terms	**Meaning**
Using the VLE can improve my **performance**	Improve Performance is the evaluation of a person's ability or state of mind based on how this person well perform certain tasks ,in this case using technology (VLE). It aids to understand how a person works towards achieving certain goals, and thus adjust the person's environment to better help them achieve these goals.
Using the VLE in my study can increase my **productivity**	Productivity is a measure of the efficiency of producing and able to generate, create, and enhance optimum job. Productivity is a ratio of production output to what is required to produce it (inputs). Using VLE effectively can enhance the student's product of work such as coursework, report, and other tasks.
Using the VLE can enhance my **effectiveness**	Effectiveness is the capability of producing a desired result which expected via using VLE. When something is believed effective, it means it has an intended or expected outcome.
Interaction using the VLE is clear and understandable	Interaction is the process which deals with the system by using the entire VLE functionality in order to obtain its benefits.
Using the VLE in the university is a wise idea	The wise idea in this questionnaire aimed to the right decision by the decision maker to provide VLE and adopt this kind of technology.
I expect my use of the VLE to increase in the future	This means that the participants will use the VLE during his future study or after graduated and continue to for

	postgraduate.
I could complete the study using the VLE, if someone else had helped me get started	It gives an idea of training needed to use VLE.
I have a great deal of experience of using the VLE	It is students' Background of using VLE, or similar application that is available during your experience of using technology.
I trust my hunches and feelings	Related to inside feeling
I am quiet and reserved	Engaged with the entire subject
Personal relationships	Learning by relationships with classmates
I am a responsible person	When it comes to learning I am responsible to my actions

7.11.2 SAMPLE METHOD

Staff assistance included distributing the questionnaires to their classes using a simple random method; the researcher listed all target departments who aimed to distribute the survey to them, so every teacher given 50 questionnaires in the purpose to ask his students to fill the survey. The teachers were asked to use the simple random method which was chosen as a suitable and easy method to get feedback from the participants. The random method is a procedure for selecting sample from his class which the teacher think the particular class were volunteer and ready to participate, and the teacher will pick sample of at least 50 students from all population that he usually lecture them. Due to the number of students in each class usually are more than 150 students because the huge enrolment and registered students in this university as discussed in chapter two. In this regard, the researcher planed the way to distribute the survey based on the simple random method which considers that the population consists of n objects, the sample also consists of n objects, and most possible samples of n objects are equally likely to occur. Therefore, each assistance staff will distribute the survey to random students inside the class randomly by chance and each student has the same probability of being participate during the distribution without selecting particular group or special students. Thus, the principle of this technique was every student included in the class has the same possibility to be chosen to participate. Each teacher then expects to get 50 questionnaires from all the population (class). This method will allow the researcher to use statistical methods to analyse sample results. This means the researcher can use statistical methods to identify a confidence interval around a sample mean (Sekaran, 2003). The process of selecting the sample from each class is discussed primarily between the researcher and the assistance staffs; this process is described as follow:

- Each teacher should have a list of students' names of his class name that he intended to collect data.
- Each name written in small piece of paper.
- The teacher put the names on small box and then the box is shaken vigorously to ensure randomisation.
- Then 50 names are taken out of the box, and the names are recorded.
- The students were selected will participate and this method constitute the simple random sample.

The eight members of staff distributed 50 questionnaires each, with two places covered by the researcher. Of the 500 questionnaires distributed amongst the different departments, only 410 were collected during the survey period of one week. The staff confirmed that the questionnaires had been distributed. They returned the questionnaires in the appropriate envelopes including some comments prepared by the researcher to be completed by the staff, for example, difficulties in understanding the exact meaning of some terms used in the questionnaire. As anticipated, the majority of respondents indicated that they had few or no difficulties in completing the questionnaire.

The researcher entered the data into an Excel spread sheet for later upload to Statistical software and verified data entry was accomplished correctly. The SPSS package was used to analyse the data. The analysis of research questions, hypotheses testing and validation of the research model and the required techniques will be discussed in the next chapter.

The eight members of staff distributed 50 questionnaires each, with two places covered by the researcher. Of the 500 questionnaires distributed amongst the different departments, only 350 were collected during the survey period of one week. The staff confirmed that the questionnaires had been distributed. They returned the questionnaires in the appropriate envelopes, including some comments prepared by the researcher to be completed by the staff; for example, difficulties in understanding the exact meaning of some terms used in the questionnaire. As anticipated, the majority of respondents indicated that they had few or no difficulties in completing the questionnaire.

The researcher entered the data into an Excel spread sheet for later upload to statistical software and verified data entry was accomplished correctly. The SPSS package was used to analyse the data. The analysis of research questions, hypotheses testing and validation of the research model and the required techniques will be discussed in the next chapter.

7.12 CONCLUSION

This chapter presented and discussed various issues and requirements associated with the research’s design topology and classification. The chapter continued to describe procedures, such as, how the instrument (questionnaire) was designed and developed, based on previously validated studies particularly in the area of technology adoption and learning styles. In addition, how the instrument and embedded constructs operated and were measured depending upon prior studies. The chapter also discussed the process of translating the questionnaire from English into Arabic so that it was understandable in the participants’ own language. The chapter described the ethical concerns including those measures that guaranteed participant confidentiality. Further, it presented a justification for the choice of sampling technique to draw a research sample from the target population. The chapter discussed the procedures that were involved during the pilot study, such as, a focus group and collecting small number of units to establish reliability and validity. The findings showed that the instrument guaranteed the reliability and validity criteria and that it was ready to be used for the main study. The chapter ended by describing the instrument’s means of distribution for the main study. The next chapter discusses the analysis of the data that was gathered in order to test the hypotheses and validate the research model. With this in mind, the chapter will investigate the relationships that exist between the variables and their impact on the proposed model with suitable techniques carefully adopted to satisfy the purpose of the analysis.

8 DATA ANALYSIS AND RESULTS

8.1 INTRODUCTION

The previous chapter described the structure and guidelines for the empirical work, which informed the requirements of the research's design.

This chapter presents an analysis of the data and its interpretation. The chapter starts with a preliminarily analysis to provide an additional source to assist in understanding the advanced analysis. It provides and discusses the demographic analysis of the variables proposed early in the previous chapter. The chapter then describes the normality analysis test which examine the distribution of data, then followed by the outlier of the data analysis. The chapter then moves to describe the reliability and validity of the constructs to ensure the data generates confidence in the instrument. The chapter next describes the suitable carefully selected techniques required in order to obtain reliable outcomes. This is followed by the advanced stage of analysis to examine the hypotheses outcomes, by dividing it into three parts. Finally, this chapter details the conclusions of the hypotheses testing.

8.2 QUESTIONNAIRE ANALYSIS

Paper-based questionnaires were used to collect the data from the site. The rationale for which was described in chapter six. As has been mentioned, the target subjects and the units were full time undergraduate students at the university. The purpose of distributing the questionnaire to the university's major departments was to measure the specialisation constructs, one of the main factors that may play a significant role in the process of acceptance or rejection of VLE.

In the second week of December 2009, the researcher handed 50 questionnaires to eight members of staff each for use during a class session. Each lecturer arranged a survey session, which lasted approximately15-20 minutes. These sessions were held before the end of lecture specifically for those students participating in this survey. During this time, the lecturer explained the aim of the survey and its importance to the research in order to enhance the processing of adopting and using the technology. With this in mind, students were encouraged to co-operate as volunteers. Five hundred questionnaires were distributed amongst the different departments. Of these four hundred and ten were collected and returned to the researcher by staff during a single week. Three hundred and two questionnaires were usable and the items completely answered. One hundred and eight, however, were discarded because they were incomplete. This was because these participants either ignored or did not pay proper attention to the various new and unfamiliar items contained within the questionnaire. Despite this, the overall response rate was acceptable. Raykov and Marcoulides (2006) state that there is no proper sample size agreed between researchers. In this context, Kline (2010) states that a sample size of one hundred is too small, however, a sample that offers two hundred observations would count as a minimum. On the other hand, a suitable sample size remains an issue because it is problematic to survey the entire population.

A primary check on the data in the Excel file did not show any problems, such as, missing or incomplete data. This is because the data had been filtered before being entered into the Excel file. Prior to working on the main analysis and testing the hypotheses, it is appropriate to declare the abbreviations of the constructs used. The next section describes the abbreviations, along with the demographic analysis, which is followed by the normality test, outlier and the procedures whereby the reliability and validity of the instrument are established before any further analysis was undertaken.

8.2.1 ABBREVIATIONS OF THE CONSTRUCTS USED IN THE ANALYSIS

In the analysis process, the SPSS 16.0 package was used, wherein the researcher named abbreviations for each construct (variable). The rationale for this is to make the construct names more convenient for the purpose of the analysis. Table 8.1 shows the abbreviated names of each construct used during this chapter.

Table 8-1Abbreviations of variables used in the analysis

Construct Name	Abbreviation Used for Analysis
Perceived usefulness (PU)	PU
Perceived ease of use (PEOU)	PE
Attitude	ATT
Behavioural intention to use	BI
Gender	Gender
Subjective norms	SN
Specialisation	SP
Job relevance	JR
Self-efficacy	SE
Experience	Exp
Complexity	CX
Concrete experience	Divergers
Reflective observation	Assimilators
Abstract conceptualisation	Convergers
Active experimentation	Accommodators

8.3 DEMOGRAPHIC PROFILE ANALYSIS

The demographic background description statistics are shown in Table (8.2) below. The demographic variables presented by the instrument are gender, year of study, education, specialisation and experience (years of use). As indicated in Table (8.2), out of 302 respondents, 166 were female (55%), whilst 136 were male (45%). One possible explanation for the slight difference between females and males is the increasing enrolment of female students in the country. In addition, females may be more respectful towards tutors and as a result more, compared to males, may have responded. Another possible explanation for this gender difference lies in the nature of Libyan society where females are dutiful towards commitment to institutions in society. The majority of the respondents were final-year students in Year 4 of their course and accounted for 100 or 33.1% of the total sample. The next largest group was composed of first year students. This group accounted for 73 or 24.2% of the total sample. The next group comprised third- and second-year students representing 71 and 58 or 23.5% and 19.2% respectively of the total sample. The education variable showed that all the students were undergraduates from Year One to Year Four (Bachelor BSc/BA). Unfortunately, there were no graduates in the sample owing to the nature of the university, which does not offer this type of degree. Only a small number of departments offer Masters Degrees in Libyan Universities. Table (8.2) shows that 302 of the respondents or 100% were undergraduates.

The specialisations (Major) were divided into three groups as stated in the previous chapter. The first group represents the Natural and Formal Sciences numbered 105 or 34.8%; the second group, Professional and Applied Sciences, numbered 106 or 35.1%; and the third group, Social Sciences, numbered 91 or 30.1% of the total sample respectfully. Table 8.2 shows the frequencies of the specialisations of the sample. The number of years using the VLE system (Table8.2) shows that those having up to and including two years experience accounted for 179 or 59.9% of the respondents and comprised the majority of the sample. The second group comprised of 120 or 39% of the students and had between 2 to 4 years experience. Unfortunately, however, only 3 or 1.0% of the respondents had more than four years' experience of using the system. These statistics shows that the students in Libya had no experience with the system either in the university or in their past studies as no such technology exists in secondary schools where the students studied previously. This indicates that the students gained experience in using these technologies only when they attended the university.

Table 8-2Demographics variables analysis

Demographic variables	Frequency	Percentage (%)	Total
Gender			
• Male	136	45.0	
• Female	166	55.0	302
Year of study			
1	73	24.2	
2	58	19.2	
3	71	23.5	
4	100	33.1	302
Education			
• Under Graduate UG	302	100.0	302
Specialisation			
• Natural & formal Sc	105	34.8	
• Professional & applied	106	35.1	
• Social Sc.	91	30.1	302
Experience			
• <= 2 years	179	59.3	
• 2-4 years	120	39.7	
• >4 years	3	1.0	302

8.4 NORMALITY ASSESSMENT

Statistical techniques of analysing data are typically divided into two tests, namely, parametric and non-parametric. It is important prior to the performance of any statistical analysis, to check that the collection of the data did not violate any of the assumptions upon which a particular statistical test is based (Park, 2008). Accordingly, several statistical analysis techniques assume that the distribution of scores on variables is normal. In the case of parametric statistical techniques, for example, t-test and ANOVA, correlations and regression, assume the distribution scores of the variables are normal. On the other hand, non-parametric techniques do not require parametric assumptions like normality. For example, they use the Anderson-Darling test and the Kaplan-Meier and Wilcoxon test. Several researchers, however, tend to ignore these restrictions and continue with the data analysis (Chong, 2005). The use of a parametric test should be on data that is parametric otherwise it causes the results to be inaccurate. Thus, it is essential to ensure the nature of data in order to select the appropriate statistical test to be used in the analysis (Hair *et al.*, 2006).

Normality is the primary assumption that should be assessed before performing any analysis. Normality of data can be assessed by using two statistical tests i.e. skewness and kurtosis. They use a numerical method. Numerical methods provide summary statistics for skewness and kurtosis in objective ways of assessing normality (Park, 2008). The skewness value offers an indication of the proportion of the distribution. The kurtosis value provides information about the “peakedness” of the distribution (Pallant, 2001). It is stated histograms or probability plots are the latest method to be used to analyse data of the actual distribution verses normal distribution. Several researchers have used this technique (Field, 2005).

In this context, univariate normality can be measured by using skewness and kurtosis, which are widely used for this purpose. In addition, Raykov and Marcoulides (2006) state that sample size plays a vital role in supporting normality, in that a large sample can assist to reduce non-normality. As previously stated in chapter five this study has a suitable sample size and this will help to setup primary assumptions for the analysis of this research.

The skewness test is used to shift the distribution. A positive sign result will shift the distribution to the right. A negative sign result shifts the distribution to the left. On the other hand, the kurtosis test is used to illustrate the height of the distribution. Kurtosis tests use "peakedness." A positive kurtosis shows the peaked compared to the normal distribution. A negative kurtosis indicates the distribution is flatter. In order to determine normality the criteria reported by (Hair *et al*, 2006; George and Mallery, 2007) as follow was used.

The skewness absolute value <= 30.0

The kurtosis absolute value <=10.0

The results of both the skewness and kurtosis tests for this study show that the distribution of all independent and dependent variables included in the model are normal and satisfied the suggested range and criteria. Table (8.3) demonstrate the results and the value of each test is the average of each construct.

Table 8-3Normality descriptive assessment

Variables	Skewness		Kurtosis	
	Statistic	Std. error	Statistics	Std. error
Perceived usefulness	-1.62	0.121	1.79	0.03
Perceived ease of use	-0.91	0.101	0.95	0.12
Attitude	-1.25	0.012	2.34	0.03
Behavioural intention to use	-1.14	0.108	1.41	0.03
Subjective norms	-0.63	0.121	0.67	0.03
Specialisation	-0.62	0.145	0.69	0.12
Job relevance	-1.27	0.023	1.27	0.03
Self-efficacy	-0.79	0.123	0.88	0.11
Experience	-1.92	0.191	1.16	0.28
Complexity	-0.34	0.110	1.22	0.02
Concrete experience	-2.34	0.202	2.41	0.13
Reflective observation	-1.98	0.211	2.23	0.14
Abstract conceptualisation	-1.23	0.112	1.96	0.95
Active experimentation	-2.01	0.09	1.63	0.43

8.5 OUTLIER

According to Kline (2005) outliers are values that are noticeably distinguished (by inspection) among the response values during data collection. It is important to detect outliers before any advanced analysis in order to validate the research model and conduct the multiple regressions by removing the impact of outlier cases. It has been stated that the effects of cases identified as outliers result in inaccurate results and altered regression lines when the tests are generated. Outliers arise from four possible causes: (1) mistakes in data entry or observation, (2) an explainable unusual observation, (3) an unexplainable unusual observation and (4) unusual combinations of ordinary observations (Lloyd, 2000).

In order to handle these cases it must be decided upon an item-by-item basis. As been mentioned by Field (2005) the most common technique used to detect cases is by examining the scores of standard deviations, which involves inspecting the value around the mean. Therefore, cases greater than three standard deviations are regard as outliers. Subsequently, the outlier tests that were carried out and the results in Table (8.4) confirmed that there were no outlier cases among the data and it satisfied the suggested range. Some cases, however, were found to be outliers involving questions of learning styles. Questions eleven and twelve were considered multiple outliers. Eliminating outliers is cautioned against because they might still be representative of the population (Hair, *et al.*, 1992). The causes for these outliers probably arise because of misunderstanding the items, the students have no stake in this subject or they do not receive any course credit for participating in this research.

Table 8-4Outlier descriptive assessment

Variables	Mean	Std. deviation
Perceived usefulness	5.1959	0.67
Perceived ease of use	5.3554	.0.81
Attitude	5.5166	0.32
Behavioural intention to use	5.8464	0.27
Subjective norms	6.2252	0.42
Specialisation	5.1522	0.52
Job relevance	4.5083	0.41
Self-efficacy	5.3416	0.79
Experience	2.1490	0.76
Complexity	3.9117	0.96
Concrete experience	5.2109	0.98
Reflective observation	5.1963	0.94
Abstract conceptualisation	5.2150	1.11
Active experimentation	5.1505	0.96

8.6 RELIABILITY AND VALIDITY OF THE INSTRUMENT

The research model included seventy-two items representing fifteen latent variables: perceived usefulness, perceived ease of use, attitude towards use, behavioural intention, learning styles (Concrete experience, Reflective observation, Abstract conceptualisation, and Active experimentation), subjective norms, job relevance, self-efficacy, experience and complexity. Before going further into regression analysis, reliability and validity of the constructs should be examined in order to ensure the validity of the instrument (Straub, 2005). The following sections describe construct reliability and validity. Hair *et al.* (2006) recommend conducting reliability testing prior to construct validity.

8.6.1 CONSTRUCT RELIABILITY

According to Davis (1989), reliability is the degree to which the items that represent the construct are used to measure the same essential attribute. The reliability test was used in this research to measure the internal consistency of the constructs. Straub *et al,* (2004) stated that internal consistency testing is a typically used technique that examines the constructs' reliability. Composite reliability is the more common form and is usually measured by the Structure Equation Model (SEM). This research study, however, is cross-sectional and conducted at one time. It is, therefore, important to test its internal consistency reliability. Three different approaches can measure internal consistency reliability: Split-half reliability, Kuder-Richardson and Cronbach's alpha. Cronbach's alpha (α) is the most popular technique, whichhas been used by many IS researchers (Davis, 1989; Agarwal & Sambamurthy, 2002; Benbasat, & Barki, 2007; Kolb, 2000; Heffler, 2001) who employed this technique to examine construct reliability and measure how well the items measure the construct (Straub *et al.* (2004)). It is used in this research by utilising the technique in the SPSS software. As mentioned above internal consistency is measured by deploying the Cronbach's alpha. Cronbach alpha is not a statistical test. It is a coefficient of reliability or the consistency between the items. Cronbach alpha is computed via the following formula that calculates the number of test items and the average inter-correlation between the items. The formula for the standardised Cronbach's alpha (Agarwal & Sambamurthy, 2002) is represented as:

$$\propto = \frac{N.r\sim}{1+(N-1).r\sim}$$

Where N is the number of the items and r-bar is the average inter-correlation of items among them.

An increased number of items cause the Cronbach's alpha to increase. Further, if the r-bar is small then the Cronbach alpha result will be low and vice-versa.

A Cronbach's Alpha of 0.7 or more is considered to be acceptable and reliable in IS and social science research (Chau &Hu, 2001; Teo &Lim, 1996). Based, however, on Bagozzi &Yi (1988) the scale measures of the constructs were considered reliable if the values of each construct were greater than 0.6. Accordingly, it was decided to compare the present study's findings with previous IS adoption studies in order to match the compatibility of this research's results and thereby agree the criteria for internal consistency. Table 8.5 shows the results of the previous literature studies, whilst Table 8.6 shows the previous study of Swesi (2008), and Table 8.7 shows the present study results.

Table 8-5Cronbach's Alpha of items used by prior studies

Constructs	Author	Cronbach's Alpha for Items
PE	Davis *et al*. (1989); Chau (2001)	0.89
PU	Chau (2001)	0.84
Attitude	Al-Gahtani (2001); Davis (1989)	0.83, 0.85
Behavioural Intention	Chau (2001)	0.81
Subjective norms	Venkatesh & Davis (2000)	0.81
Job relevance	Venkatesh & Davis (2000)	0.80
Self-efficacy	Chau (2001); Anandarajan *et al*., (2000)	0.93, 0.80
Experience	Igbaria, Guimaraes & Davis (1995)	0.77
Complexity	Igbaria *et al*. (1996)	0.76
Concrete experience	Heffler (2001)	0.62
Reflective observation	Heffler (2001)	0.74
Abstract conceptualisation	Heffler (2001)	0.82
Active experimentation	Heffler (2001)	0.79

Table (8.5) shows that almost all of the constructs are above the acceptable range of >0.7 and hold a strong level of reliability, ranging from 0.76 to 0.93 except learning styles, which will be discussed separately. These reliability scales have been empirically tested during previous studies and they satisfy the requirement for reliability.

In this study, the internal consistency for the questionnaire items for all constructs: PU,PEOU, ATT, BI, external variables (subjective norms, job relevance, self-efficacy, experience and complexity) show that they all demonstrate a strong level of reliability. Table (8.7) shows the results of the Cronbach'sAlpha (α) for the constructs that potentially affect VLE usage. The respondents had no problems in completing the questionnaires and responding to the items listed. Consequently, as indicated in Table

(8.7) (also see Appendix A, Reliability), the reliability measures for each construct display a high degree of internal consistency, as the value of α is greater than 0.70. This satisfies the criteria for Cronbach's Alpha value for social science research (Straub et al, 2004). The literature indicates that Cronbach's Alpha (α) for the IS research constructs should range from 0.6to 0.90 (Chau, 2001). In a study the construct values were found to range from 0.77 to 0.96, hence, have a high value of α, which suggests that the data that was collected is reliable, therefore, confirming the validity of the instrument indicating that the evidence is suitable for further analysis.

As indicated by Table (8.6), which show the results from the previous study (Swesi, 2008) compared to the present one, there are no significant differences between the two sets of results. The small differences between the α value) of the variables is due to the sample size. The size of the sample is larger in the present study (Swesi (2008)). Sample size affects the reliability of the construct (Baker *et al*, 2007).

Table 8-6Reliability of the previous study (Swesi, 2008)

Construct Measured	**Cronbach's Alpha values**	**No. of Items**
PE	0.926	6
PU	0.942	6
Attitude (ATT)	0.87	5
Behavioural Intention (BI)	0.88	5
Subjective norms (SN)	0.77	2
Job Relevance (JR)	0.94	2
Self-efficacy (SE)	0.85	6
Experience (EX)	A single item that was not measured	1
Complexity (CX)	0.88	3

Table 8-7Reliability of the present study

Construct Measured	Cronbach's AlphaValues	No. of Items
PE	0.952	6
PU	0.962	6
Attitude (ATT)	0.90	5
Behavioural Intention (BI)	0.92	5
Subjective norms (SN)	0.86	2
Job Relevance (JR)	0.95	2
Self-efficacy (SE)	0.91	6
Experience (EX)	A single item that was not measured	1
Complexity (CX)	0.92	3
Concrete experience (CE)	0.62	12
Reflective observation (RO)	0.77	12
Abstract conceptualisation (AC)	0.57	12
Active experimentation (AE)	0.61	12

The prior studies of (Kayes, 2005; Wierstra & DeJomg, 2002; Veres *et al*, 1991; Hifler, 2001) suggest that learning style LSI scales show acceptable internal consistency reliability in different populations. For example, Kayes (2005) conducted a study by asking liberal art students to fill LSI online. He confirmed the reliability for the four types of learning styles with the range >0.70 scoring from 0.78 to 0.84. Veres *et al.*, (1991), however, conducted a study by repeating the questionnaire at different times with different sample sizes. They found that the scale (α)of AE is 0.52 and CE was 0.56 on a second occasion, while on the first occasion the scale was 0.70 as average of all types. They reported that students may change their opinions after a while, however, they suggests the values are acceptable for internal consistency in the learning styles field. Table (8.7a) shows the internal consistency for the previous studies that adopted LSI as an instrument to explore the preferred learning styles and reported the reliability of the instrument.

The reliability of learning styles LSI in this study scored from 0.57 to 0.77, which shows slightly low reliability but it ranged from moderate to good and remains acceptable as recommended by the researchers. Table (8.7a) show the scale of AC slightly less than the required range >0.6. This mean Abstract conceptualisation needs further investigation. This was consistent with some previous studies, which found similar low reliability.

Despite the support of numerous of studies that confirms the reliability of LSI, other studies examining the psychometric properties have criticised its reliability (Newstead, 1992; Smith, 2001; Swailes&Senior, 2001; Penger *et al*., 2008). According to Kolb (2000) said, “Since the first publication of the learning style inventory in 1971, hundreds of studies have tested its validity and applicability”(p. 70).

This study confirmed the validity of the instrument, as indicated in Table 8.7 of this study.

Table (8.7a) internal consistency for LSI score from previous studies
Source: (Kolb & Kolb, 2005)

Source	N	CE	RO	AC	AE	AC-CE	AE-RO
On-line Sample	5023	.77	.81	.84	.80	.82	.82
Kayes (2005)	221	.81	.78	.83	.84	.77	.84
Wierstra & DeJong (2002)	101	.81	.78	.83	.84	.83	.82
Veres et al. (1991)*	711 Initial 1042 Rep.	.56 .67	.67 .67	.71 .74	.52 .58	— —	— —
Ruble & Stout	323 (1990) 403 (1991)	.72 .67	.75 .78	.72 .78	.73 .78	— —	— —

*Alpha coefficients are the average of three repeated administrations. Alphas for the initial administration were higher (average = .70).

8.6.2 VALIDITY

Validity is defined as the extent to which the selected instrument measures what it is designed to measure (Carmines& Zeller, 1979). There are three types of validity in quantitative research: content validity, criterion validity and construct validity.

1. Content validity refers to whether the questions are a well-balanced sample of the domain to be covered. The literature on the various constructs and measurement scales adopted by this study established that the chosen set of statement/items represent a subset of a universe of appropriate items of construct. The careful selection of items from previous studies as well as their pre-testing established the content validity of the measurement scales (Cronbach & Meehl, 1955).
2. Criterion validity considers the relationships between construct score and measurable criterion. If the scale can be empirically established and predict the future with respect to gold standards, criterion validity is then established (Kerlinger, 1980). In the current study, criterion validity is established by comparing scores in the current study with scores from the previous ones under similar sampling conditions (Swesi, 2008).
3. Construct validity is concerned with whether the instrument measures what we think it measures via designed questions. Construct is degree to which logical target phenomena is captured by the instrument. It is established by its relationship to other variables; both related (convergent validity) and unrelated (discriminant validity) (Cronbach & Meehl, 1955). Conversion validity is established because the test indicates a high correlation amongst items of the same construct, as well as a higher value of Cronbach'sAlpha and also a high

factor loading (> 0.7) (Fornell & Larcker, 1981), that is, the average variance extracted is more than the measurement error for that construct in factor analysis. The results of factor analysis via a Kmo and Bartlett's Test indicate that the data is suitable for factor analysis and construct loadings. Factor analysis was conducted as suggested methodological process to improve the measurement model fit if any factor loading occurs. (Segar & Grover, 1998). Fortunately, all the items of the constructs of TAM core and External variables showed acceptable fits of measures and fall in the range of >0.5. According to Hair et al, (2006) items with a loading of <.50 have to be removed, otherwise a visual test for any residual matrix should be conducted. Tables (8.8.1 to 8.8.8) show the results of the factor analysis with Cronbach alpha values for each variable. The analysis indicated that no factor loading resulted (see also tables of factor analysis in Appendix A).

Notably, the discriminate validity of various constructs is also established because of the low correlation between items of one construct and those of a different one. Hence, the various constructs may be considered as content, criteria and construct validity.

Table 8-8Construct validity analysis of TAM and external variables

Table 8.8.1 Construct validity analysis of PEOU

Construct Items	α value of each	α Test
PEOU1	.918	.914
PEOU2	.916	
PEOU3	.920	
PEOU4	.938	
PEOU5	.923	
PEOU6	.918	

Table 8.8.2 Construct validity analysis of PU

Construct Items	α value of each	α Test
PU1	.881	.872
PU2	.880	
PU3	.923	
PU4	.916	
PU5	.921	
PU6	.867	

Table 8.8.3 Construct validity analysis of Attitude

Construct Items	α value of each	α Test
ATT1	.830	.797
ATT2	.820	
ATT3	.901	
ATT4	.864	
ATT5	.855	

Table 8.8.4 Construct validity analysis of Behavioural intention

Construct Items	α value of each	α Test
BI1	.746	.843
BI2	.812	
BI3	.779	
BI4	.820	
BI5	.677	

Table 8.8.5 Construct validity analysis of Subjective Norms

Construct Items	α value of each	α Test
SN1	.939	.500
SN2	.939	

Table 8.8.6 Construct validity analysis of Job Relevance

Construct Items	α value of each	α Test
JR1	.918	.500
JR2	.916	

Table 8.8.7 Construct validity analysis of Selef-efficacy

Construct Items	α value of each	α test
SE1	.849	.846
SE2	.870	
SE3	.897	
SE4	.908	
SE5	.811	
SE6	.704	

Table 8.8.8 Construct validity analysis of Complexity

Construct Items	α value of each	α Test
CX1	.918	.698
CX2	.963	
CX3	.908	

α→ Cronbach alpha

The study conducted the factor analysis separately for learning styles constructs CE, RO, AC, and AE, as shown in Table (8.9). Each learning style has 12 items, each of which has a value of Cronbach's Alpha that calculates the internal consistency of the item. The factor analysis results show that there was only one factor extracted from the statements; this indicates that only one component was extracted and so the solution cannot be the rotation of learning styles. The four learning styles—CE, RO, AC, and AE—each has ten items, as shown in the tables below. Importantly, the ten itemsrepresent one learning style, as described by Kolb (2000). All of the items showed the above requirement during factor analysis and no factor loading resulted; thus, the factor analysis of the items of this instrument was validated this is consistent with previous studies (Kayes, 2005; Wierstra & Dejong, 2002).

Table 8-9Factor analyses for items used in the questionnaire (learning styles)

Factors			
Concrete Experience (CE)	**Reflective observation (RO)**	**Abstract conceptualisation (AC)**	**Active experimentation (AE)**
1A → 0.67	1D → 0.78	1B → 0.72	1C → 0.68
2C → 0.69	2A → 0.79	2B → 0.90	2D → 0.69
3D → 0.81	3C → 0.77	3A → 0.91	3B → 0.90
4A → 0.72	4C → 0.86	4D → 0.86	4B → 0.93
5A → 0.86	5B → 0.82	5C → 0.88	5D → 0.86
6C → 0.69	6A → 0.79	6D → 0.84	6B → 0.80
7B →0.76	7A → 0.68	7C → 0.76	7D → 0.79
8D → 0.86	8C → 0.67	8B → 0.70	8A → 0.63
9B → 0.89	9A → 0.79	9D → 0.76	9C → 0.64
10B → 0.86	10A → 0.82	10D → 0.74	10C → 0.69
11A → 0.91	11B → 0.84	11C → 0.77	11D → 0.68
12B → 0.71	12C → 0.86	12A → 0.88	12D → 0.84
CE AVERAGE = 0.74	RO AVERAGE = 0.76	AC AVERAGE = 0.78	AE AVERAGE = 0.69

CE Total=	1A+2C+3D+4A+5A+6C+7B+8D+9B+10B+11A+12B

RO Total=	1D+2A+3C+4C+5B+6A+7A+8C+9A+10A+11B+12C

AC Total=	1B+2B+3A+4D+5C+6D+7C+8B+9D+10D+11C+12A

AE Total=	1C+2D+3B+4B+5D+6B+7D+8A+9C+10C+11D+12D

8.7 DATA ANALYSIS TECHNIQUES TO TEST THE HYPOTHESES

Several methods were used during this analysis. The different methods are applied to particular stages in the analysis to establish validation and to ensure a precise instrument exists to collect the data. These methods are statistical tests that have been selected based on the research questions to deliver answers for the corresponding research hypotheses formulated in chapter five. The descriptive analysis as presented in the above section suggested that the data for most of the variables are parametric and the distribution of all variables as demonstrated by the skewness and kurtosis tests is normal. This study aims to establish the presence or absence of a relationship between single and multiple sets of variables and to discover the key factors related to the research problem.

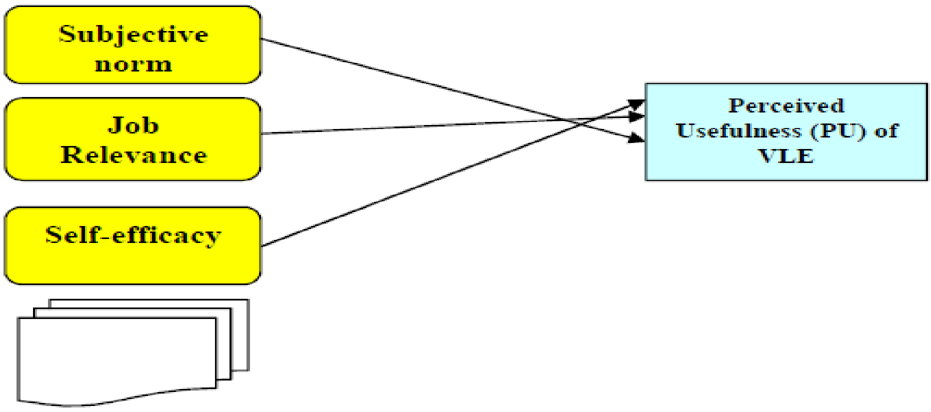
This study adopted techniques based on the nature of the research model. There is a need to identify any relationships that might exist between the variables that were selected to have an impact on the model to answer to the research question. Other techniques were adopted to address learning styles impacts and its moderation, such as, univariate ANOVA, Pearson correlation and chi-square. This, therefore, requires different techniques based on the nature of the hypothesis and this will be discussed later. In order to validate the research model and test the hypotheses to explain the relationships between the suggested variables, the methods were selected based on the nature of the proposed model and the direct impact of the variables under their proposed hypotheses presented in chapter five.

The next section is divided into two parts to make the analysis more convenient It starts with the hypotheses that are associated with the TAM core constructs and the external variables relationships using suitable techniques that provide the interpretation required. The analysis as mentioned above is divided into two parts as follows.

Part One: Multiple regression models

The multiple regression model technique was carried out in this part of the analysis at four levels. Level one, examined the relationships between external variables [gender, subjective norms (SN), specialisation (sp), job relevance (JR), self-efficacy (SE), experience, (exp), complexity (CX), perceived ease of (PEOU)] as the independent variables and perceived usefulness (PU)as the dependent variable. Level two examined the relationships between external variables [gender, specialisation (sp), and self-efficacy (SE)] as the independent variables and perceived ease of (PEOU) as the dependent variable. Level three examined the relationships between beliefs constructs PU & PEOU as the independent variable and attitude towards use (ATT) as the dependent variable. Level four examined the relationships between attitude (ATT) & PU as the independent variable and behavioural intention (BI) as the dependent variable. The mean values of the variables within the constructs or factors were measured and a correlation analysis was conducted on these values. The two-tailed Pearson's correlation coefficient (r^2) will be conducted to calculate the variance of the variables. In addition, ANOVA analysis of variance between groups will be conducted to establish the compare the means between the group of variables and the variance between them. If they prove difficult to compare then the t-test will carried out to differentiate the values between them. For illustrative purposes, the following example Figure (8.3) is taken from the model. In the example subject norms (SN), job relevance (JR), self-efficacy (SE) represents the independent variables and they have direct relationships with the dependent variable PU.

Figure 8-1multiple regressions between eternal variables and PU



Multiple regression model techniques (as termed by Pearson in 1908) measure the relationships between various predictors (independent) variables and a dependent variable. It shares the same concept as simple regression apart from the fact that a number of independent variables predict the dependent variable. In this study, there are external variables (independent) shown in the research model that are expect to predict the behavioural intention to use VLE via attitude and beliefs constructs. Thus, multiple regressions are appropriate for conducting this analysis and in turn able to response to the research questions. The line of regression in case of multiple regressions can be defined by the equation (Stockburger, 2010):

$$Y_i = b_0 + b_1X_{1i} + b_2X_{2i} + \dots + b_nX_{ni}$$

Where Y: is dependent variable
a: is a constant, b: is slope, X: is independent (predicator)
n is the number of independent variables.
b values are calculated in a way that minimize the sum of squared deviations

In addition, the study will examine critical factors, which test the best predictors based on the beliefs constructs PU and POEU variables. To do this, stepwise regression analysis will be carried out. This type of regression technique allows for the identification of the unique contribution of each predictor variable to the regression model (Hair *et al.*, 1998).

In the literature multiple regression method is strongly recommended for the following reasons (ESRI, 2012).

1. To model some phenomena in order to better understand it, for example, to measure the extent that changes in one or more variables jointly affect changes in another. In this research the researcher was interested in joint effects of many IVs on DVs on the research model.
2. To model some phenomena in order to predict values for that phenomenon.
3. To test hypotheses. The researcher has used multiple regression for testing hypothesis based on the nature of the research model.

However multiple regression can cause problems. In case of Omitted explanatory variable, having Non-linear relationship, outliers Multicollinearity and Heteroscedasticity etc., can give biasing regression coefficients.

The researcher has tested that there is linier relations (ANOVA indicated that), the data was tested and found no outliers (chapter eight, P()), the VIF indicated no multicollinearity for most analysis and the normal distribution of residuals take care of heteroscedasticity etc (Field, 2005). Hence the chosen method of multiple correlations was best option under current conditions to test the proposed hypothesises and understands the phenomenon of technology adoption see section 8.8.

Part Two: Learning styles and beliefs constructs of TAM with its relationships.

The hypotheses H18a, H18b, H19, H20 and H21 were examined to establish the relationships between learning styles and the TAM variables model separately using different techniques, such as, univariate ANOVA, Pearson correlation and regression coefficients and cross-tabulation along with chi square tests. The learning styles model is considered the independent variable with PU and PE as the dependent ones. Furthermore, the learning styles variables are measured as moderated variables between the external variables and the TAM constructs.

Univariate ANOVA is a technique performed on one dependent variable to determine the effects of one or more independent variables. A test that is rooted in the family of ANOVA, it uses the variance-covariance between variables in testing the statistical significance of the mean differences when the test involves only one dependent variable (Gay *et al.,* 2006). There are two different ANOVAs; a one-way ANOVA is a univariate GLM that includes only one independent variable. On the other hand, a two-way ANOVA is also a univariate but it is used when there are two or more independent variables in the test. The univariate test examines the effects of a group of independent variables on a single dependent variable. Accordingly, it can examine connections between variables and the effects of covariates and their interactions with the variables that are included. In this study, it is possible, therefore, to examine the effects of the group of learning styles (divergers, convergers, assimilators and accommodators) as independent variables that have different scores on the PU as the dependent variable. This technique was used in order to test hypothesis H18a and to consequently answer research question one.

Pearson correlation and regression coefficient tests were carried out to examine the moderation effect of the learning styles of the group on the various independent variables involved in the research model (external variables). Pearson correlation comparisons across learning styles allow the study to investigate the significant value of each independent variable across learning styles. It is intended that the comparison will demonstrate the impact of each different learning style on a single independent variable and single out the most moderated learning group that impacts on the research model. This was done in order to test hypothesis H18b as well as the responses to question four. The Pearson correlation has a value between -1 and +1. It determines the degree of relationship between two variables. The positive value indicates a positive relationship, while a negative value of correlation indicates an inverse one (Simon, 2008). The Pearson correlation can be measured using the following formula:

$$r = \frac{\sum_{i-1}^{n}(Xi - X^{-})(Yi - Y^{-})}{(n-1)Sx\,Sy}$$

Where X and Y are two variables, X^{-} and Y^{-} are the mean values of variables *X* and *Y*. *Sx* and *Sy* are the respective standard deviations of the variables.

Having discussed the major statistical techniques required to analyse the data collected by the research's survey (as previously described) the next section describes all the procedures for testing the hypotheses.

8.8 RESEARCH HYPOTHESESTESTING

Hypothesis testing is the rational framework for conducting statistical tests. Researchers usually extract findings by using statistical methods to examine the sample data whether it is significant or not. A hypothesis test is a rule that decides upon the acceptance or rejection of the null hypothesis based on the results of a random sample of the population under consideration. In this context, before testing any hypothesis there are some thoughts that should be considered. The tests will disprove hypotheses instead of proving them. The aim is to determine if an idea is untenable, because there is an unsatisfactorily small probability that it is true. Accordingly, the hypothesis to be disproved is generally selected to be the one that often takes the form of no change, no relationships and no difference. This is then referred to as the *null* hypothesis (Berry, 2006). On the other hand, the alternative hypothesis entertains the possibility of change, differences or effects. It often takes the form of there is change, there is difference.

Based on the above discussion, this study has formulated the hypotheses based on the alternative hypothesis, which is labelled H1 and it represents the possible change or difference. For example, hypothesis one presented in research hypotheses in chapter five, that is, *H1.Perceived Ease of Use (PEOU) of the VLE is positively related to Perceived Usefulness (PU) of the VLE amongst Libyan university students.* Major hypotheses in this research were on the positive side. In each case, the null hypothesis proposes there is no relationship between the independent variable and the named dependent variable. This approach has been adopted by numerous previous studies (William & James, 2006).

This section examines the research hypotheses in three parts. Each part will demonstrate the hypotheses based on the appropriate technique adopted for the nature of the research model and the direct path of each hypothesis.

8.8.1 PART ONE: MULTIPLE REGRESSION ANALYSIS (PU/PE WITH EXTERNAL VARIABLES, ATT AND BI).

8.8.1.1 PU and its antecedents

The relation was verified with the aid of multiple regression models. The method of dummy variables was used to establish regression models. For instance, all four specialisation groups were divided into three dummy variable categories. In the case of the gender variable only one dummy variable was used (male=0, female= 1). Table 8.10 below gives the abbreviations of the specialisation groups used in the analysis.

8-10Abbreviations of specialisation construct

Department or Specialisation	Name of the Variable
Natural and formal science	**ns**
Professional and applied science	**app**
Social science	**ss**

The regression was performed between PU as the dependant variable and its various independent ones. The results of the regression analysis indicate that gender had no significant influence. Complexity (CX) had partial influence and Job relevance had a minor negative coefficient (beta coefficients) on Perceived Usefulness (PU). The collinerity was also low (VIF<<10). All other independent variables (PE, specialisation, Self-efficacy and experience) had significant coefficients. Regression models may be written as below:

A.PU = (1.525 +.630*A.PE +.274* dummynatural +.172* dummy professional -.143* A.JR +.180* A.SE -.070*ASN -.067*A.CX +.133 * EXP). (unstd) --------model 1

A.PU = (1.510+.627*A.PE +.280* dummynatural +.178* dummy professional -.149* A.JR +.182* A.SE -.067*ASN +.137* EXP).(std) ---------- model 2.

The standardised coefficient model is more applicable and easy to interpret as it standardises all different scores. As shown by regression, the coefficient in Model 2, the dummy specialisation (ns = natural science & professional), Self-efficacy and experience had a significant impact on Perceived Usefulness (PU). Dummy natural science has a more effect as compared to professional or social sciences (b-natural=0.280; dummy-professional =0.178, dummy social=0.0); therefore, the multiple regression model also leads to the rejection ofthe null hypotheses: H1, H10, H11, H13, H14, H16, and H17(P<.05).

The results, however, indicate that the null hypotheses of H6 and H7 are not rejected at all and thus present somewhat self-conflicting results between simple and multiple regressions. There may be many reasons for this conflict. First, the multi-collinearity may create spurious B coefficients. Secondly, there may have been inconsistency in completing in the questionnaire or there may have been response errors. Thirdly, the independent variables that this research considered significant may not actually be true. Fourthly, in any multiple regression models, many independent variables may influence or moderate their co-independent variables, thus resulting in spurious coefficients, which are known as the partial or complete effect of independents on dependant variables. For instant, in economic theory, the coefficients between demand and supply may change when one considers joint effect of different variables (price, taste, income, etc.) together. Table 8.11 gives the hypothesis test results and the Beta with P values of the independent variables.

8-11Multiple and simple regression analysis and ANOVA on dependent variable PU

Independent Variable	**Hypothesis**	**Regression Coefficient for Independent variable beta**	**Sig. value**	**Hypothesis test with Multiple Regression**	**Hypothesis Test with ANOVA**	
Gender	H7	.015	.656	Fail to reject null	Fail to reject the null P of.415 P>.05	Fail to reject null H7
Subjective Norm SN	H10	-.070	.050	Reject null	na	Reject null
Specialisation DUMMYNATURAL	H11	.274	.000	reject null P of.047 P<.05	Reject null P of 0.000 P<.05	Reject null
Job relevance JR	H13	-.070	.007	reject null P = 0.446 P>.05	.000	Reject
Self-efficacy SE	H14	.180	.000	reject null P of 0.219 P>.05	.000	Reject
Experience EXP	H16	.133	.000	Reject null P of 0.011 P<.05	Reject null P of 0.001	Reject null
Complexity CX	H17	-.067	.078	Fail to reject t null P of 0.011 P<.05	Reject null P of 0.000	Partly Reject null
PE	H1	..630	0.000	Reject null P of 0.000 P<.05	Reject null P of 0.000	Reject null

Comments:

The correlation coefficients and VIF indicated minor multi-collinearity (VIF<10 REF….) between many independent variables (for reference see correlation Table C.4, Appendix C). In order to overcome such a problem, the researcher may drop one of the independent variables,which has a strong correlation amongst them. In this study, however, almost all independent variables have strong correlations amongst themselves because all variables influence each other. Another alternative was to use a simple linear regression model to predict the PU (e.g. look at the PE score and predict the PU score). The researcher preferred the second option and supplemented his findings from multiple regressions with simple regression.

Thus, based on the results of the multiple regression analysis, simple regression and analysis of variance (Table C.5), almost all null hypotheses (H1, H10, H11, H13 and H14, H16) were fully rejected or partly rejected (H17). The results, however, were unable to reject the null hypothesis H7 relating to the effects of gender.

Accordingly, in general, these results implied that there wasa significant relationship between the perceived usefulness as a dependent variable and its various antecedents, except gender. This result is reinforced due to the large value of adjusted R^2 ($R^{2=}$0.749, ANOVA p= 0.000; Table C2 and Table C.3, Appendix C, or see Table 8.12 and Table8.13 below) as this model can explain approximately 75% of the variance in PU due to these considered IVs. In addition, multi-collinearity was acceptable (VIF<10, and tolerance close to 1). Thus the current model has more predicting power (75%) as compared to models developed in previous studies that had low R^2 (R^2 =0.5).

An interesting result from this study has been that the specialisation of natural science (more beta) has more impact on the PU as compared to students with specialisation in professional or social sciences. It could imply that in Libya the students from computer and engineering studies are more interested in using technology as compared to other student specialisations. This may also reflect that non-science students may not have the experience so they may perceive the technology as more complex or difficult and not relevant to their study. Thus, such students may prefer traditional methods of learning instead of instruction/learning being IT based.

Model Summary:

8-12Summary Model Regression of PU

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.865[a]	0.749	0.741	0.50559
2	0.865[b]	0.749	0.742	0.50490

ANOVA:

8-13ANOVA

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	222.461	9	24.718	96.697	0.000[a]
	Residual	74.642	292	0.256		
	Total	297.103	301			
2	Regression	222.410	8	27.801	109.057	0.000[b]
	Residual	74.693	293	0.255		
	Total	297.103	301			

8.8.1.2 **PEOU and its Antecedents**

To predict the relationship between perceived ease of use and its antecedents multiple regressions was performed. To test the relationships between perceived ease of use (PE) as a dependent variable and its antecedents (Gender, Subjective Norms (SN), Specialisation, Job Relevance (JR), Self-efficacy (SE), Experience (EXP), and Complexity (CX) as independent variables, multivariate regression analysis was carried out. The SPSS proposes four stepwise linear regression models (1, 2, 3, and 4). The mean scores for PE and dummy gender, A.SN, dummy specialisation (ns, app), A.JR, A.SE, EXP, and A.CX were 5.35, 0.54, (0.34, 0.35), 4.50, 5.34, 2.14 and 3.91, respectively (see Table C.6, Appendix C). The Adjusted R^2 of 0.637 (Table C.8), for Model 1 indicates that it explains 63% of the variance in PEOU due its independent variables (Gender, Subjective Norms (SN), Specialisation, Job Relevance (JR), Self-efficacy (SE), Experience (EXP) and Complexity (CX)). The ANOVA (p=0.000, Table C.9, Appendix C) indicates that models 1–4 were significant. The results could not reject the null hypothesis of there being no significant relationships between the Perceived Ease of Use (PE) dependent variable and its antecedents Gender, Experience (EXP), Job Relevance (JR) and Complexity (CX) as independent variables. The coefficients (Table C.10,Appendix C) of Specialisation, Subjective Norms (SN), and Self-efficacy (SE) were significant (P<.05) thus rejecting the hypotheses of no effect of Specialisation, Subjective Norms (SN), and Self-efficacy (SE) on PE. This result was slightly different compared to those for PU and its independents variables, where PU was affected by almost all the independent variable.

Multi-collinearity may have interfered with the results. Certain inconsistencies between the simple and multiple regression models were also observed for PE. For instance, the regression coefficients (Table C.10, Appendix C) indicate that Specialisation, Subjective Norms (SN) and Self-efficacy (SE) had significant impacts on Perceived Ease of Use (PE). Therefore, the null hypotheses of H10a, H12 and H15 (H10a were extra and not included in our initial hypothesis) may, therefore, be firmly rejected.

These were interesting and significant results, however, using multiple regressions between PE and its antecedents the null hypotheses of H9, H13a, H16a and H17a cannot be rejected (Table C.10, Appendix C).

The paradoxical results of PU vs. PE and similar IVs may be due to multi-collinearity or response errors. Table 8.14 gives the hypothesis testing and the Beta with P values of the independent variables.

Table 8-14Multiple Regression analysis on dependent variable PE

Independent Variable	Hypothesis	Regression coefficient for independent variable Beta	Sig. value	Hypothesis test multiple regression	Hypothesis test with ANOVA	
Gender	H9, H8	-.108	.006 .656	Reject null 0.043 P<.05	Fail to reject the null P > 0.05 (0.889)	Partly reject null
Subjective Norm SN	H10a	.293	.000	Reject null 0.042 P<.05		reject null
Specialisation	H12	.302	.000	Fail to reject null 0.817 P>.05	reject null P< 0.05 (0.000)	reject null
Job Relevance JR	H13a	.006	.927	Fail to Reject null 0.000 P<.05		Fail
Self-efficacy SE	H15	.396	.000	reject null 0.473 P>.05		reject null
Experience EXP	H16a	.014	.736	Fail to reject null (0.259) p>.05	Reject null P< 0.05 (0.001)	Fail
Complexity CX	H17a	-.027	.555	Fail to reject null 0.843 P>.05	Reject null 0.002 P<.05	Fail

Comments:

Multiple regression analysis indicated the rejection of the null hypothesis ($p<0.05$)‘no relationships between the dependent variable Perceived Ease of Use (PE) and its antecedents (Gender, Subjective Norms, Specialisation, Job Relevance, and Self-efficacy).’ In addition, a moderately large value of Adjusted R^2 of 0.63 (Table C.8, Appendix C) shows that these IVs could explain about 63% of the variance in PE. This offers good predictive power but R square also shows that almost 37% is not explained by these IVs, which may be due to dropped/ignored IVS.

No significant relationship was found between PE and IVs, such as, experience and complexity but in the case of PU results, it was found that experience was a significant factor in determining the latter. Gender, however, show somewhat relationship with PE ($p>0.05$ (0.006) but not with PU. This was inconsistent with the findings of Gefen &Straub (1997), who found that gender had a high effect on PU. The current study found that gender had more effect on PE compared to PU. In this case, the results of this research are consistent with the findings of Venkatesh &Morris (2000) who found that women were influenced by perceived ease of use (PEOUI). In the present research, the coefficient beta of dummy gender was found negative (-0.223, where dummy male=0 and dummy female=1; Table C10, Appendix C), which means being a female (put dummy gender=1 in Model 1) results in a decrease in PEOU scores. This implies that women in Libya perceive the BCMS tool to be more difficult (the effect of culture and enforcing education in Libya). The present findings indicate a significant relationship between perceived ease of use (PEOU) and self-efficacy (SE). This result is inconsistent with the findings of Lewis *et al*. (2003).

The present findings indicate that job relevance had no significant relationship with perceived ease of use (PE), which is consistent with the findings of Venkatesh & Davis (2000). They also had found that job relevance was positively related to perceived usefulness (PU).

The regression coefficients of all dummy specialisation variables were significant, therefore, indicating the effects of specialisation on PE. The coefficient of dummy natural science was higher than that of dummy professional, thus indicating that specialisation in natural science has the highest positive impact on ease of use (PE) and social science specialisations had the least effect on PEOU. This may reflect the fact that students with social sciences and humanities regard BCMS use as being less important and so they have low scores on ease of use.

Consistent with the findings of Venkatesh &Davis (2000) and Venkatesh &Morris (2000), the present results show that subjective norm (SN) has a direct positive relationship with perceived ease of use (PE). The hypothesis, that subjective norms are positively related to perceived ease of use of the BCMS tools in Libyan university was also accepted. This result is inconsistent with the findings of Igbaria *et al*. (1995) who state that computer experience has a significant direct effect on usage via perceived usefulness. In addition, they found that experience had positive effects on PU and PE.

The present research highlights no significant relationship between experience (EXP) and perceived ease of use (PE). With this in mind, Igbaria *et al*. (1996) also found significant relationships only with PU. Similarly, the present research found no significant relationship between complexity (CX) and perceived ease of use (PE).This result was expected, because if the technology were complicated it would then be difficult and not easy to use (Igbaria *et al*., 1996).

The results indicate that Complexity (CX), Experience and Job Relevance had little or no significant influence (beta coefficients) on Perceived Ease of Use (PE). All other independent variables (Gender, Specialisation, Self-efficacy and Subjective Norms) had a significant impact on PE. SE and SN had the largest effect (see coefficients) and experience had least impact on PE. The Regression model may be written as:

A.PE= (0.059 - 0.223* dummy gender + 0.653* dummynatural + 0.58* dummyprofssioal&applied + 0.434*A.SN + 0.013*EXP+ 0. 436*A.SE) … (Model-1)

Model Summary

Table 8-15Model summary Regression PE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.798[a]	.637	.627	.62979
2	.798[b]	.637	.628	.62872
3	.798[c]	.637	.629	.62782
4	.798[d]	.636	.630	.62737

ANOVA

Table 8-16ANOVA of PE with its antecedents

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	203.862	8	25.483	64.248	0.000[a]
	Residual	116.213	293	0.397		
	Total	320.075	301			
2	Regression	203.859	7	29.123	73.673	0.000[b]
	Residual	116.216	294	0.395		
	Total	320.075	301			
3	Regression	203.799	6	33.966	86.175	0.000[c]
	Residual	116.277	295	0.394		
	Total	320.075	301			
4	Regression	203.571	5	40.714	103.441	0.000[d]
	Residual	116.504	296	0.394		
	Total	320.075	301			

8.8.1.3 Attitude (ATT) and independent variables PU and PEOU

In order to test the relationships between attitude (ATT) as a dependent variable and perceived usefulness (PU) and perceived ease of use (PE) as independent variables a multivariate regression analysis was carried out. The mean scores of attitude (ATT), PU and PE were 5.51, 5.20 and 5.36 respectively (Table C.9, Appendix C). The Adjusted R^2 of 0.44 for Model 1 indicates that 44% (Table C.11, Appendix C), 0.000 $P<.05$ (Table C.12, Appendix C) of the variance may be explained by independent variables. Thus, we can reject the null hypothesis that 'there are no relationships between the attitude (ATT) dependent variable and perceived usefulness (PU) and perceived ease of use (PE) as independent variables'. The coefficient are significant and positive ($P<.05$; C.12 Appendix C), with both independent variables (PU and PE) having an impact and showing a positive relationship to attitude (ATT).These results were similar to results from simple regression and correlation. Therefore, the null hypotheses of H2 and H3 may be rejected. Table 8.17 shows that perceived usefulness has more impact (as compared with perceived ease of use) on attitude. The standardized model may be written as:

ATT= 2.578+0.337* A.PU +0.222* A.PE… (Model-1)

Table 8-17Multiple Regression analysis on dependent variable Attitude (ATT)

Independent Variable	Hypothesis	Regression coefficient for independent variable	Sig. value	Hypothesis test with multiple regression
PU	H3	0.377	0.000	Reject null P < 0.05
PE	H2	0.222	0.000	Reject null P < 0.05

Comments:

Results imply that there is a positive relationship between Attitude as a dependent variable and IVs, perceived usefulness and perceived ease of use. This result was consistent with the findings in the literature (Davis *et al*., 1989). Davis (1986) states that attitude mediates between belief constructs (e.g. PU and PE) and behavioural intention to use (BI). The present results found that perceived usefulness has a stronger effect on attitude (B=0.416) as compared to perceived ease of use (B=0.284).

Model Summary

Table 8-18 ATT model summary

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.669[a]	.447	.444	.60043
a. Predictors: (Constant), A.PE, A.PU				

8.8.1.4 Behavioural Intention (BI) and independent variables PU, PE and ATT

To test the relationships between behavioural intention (BI) as a dependent variable and perceived usefulness (PU), perceived ease of use (PEOU) and attitude (ATT) as independent variables a multivariate regression analysis was carried out. The mean scores for behavioural intention (BI) and PU, PE and attitude (ATT) were 5.84, 5.20, 5.36 and 5.51 respectively (Table C.13, Appendix C). The linear regression model was significant ($P<0.05$; Table C.13 Appendix C). Adjusted $R^2 = 0.72$ (Table C.14, appendix C) implies that a high amount (72%) of the variance may be explained by the independent variables (perceived usefulness, perceived ease of use. and attitude). Therefore, the null hypothesis of there being no relationships between the behavioural intention (BI) as the dependent variable and perceived usefulness (PU), perceived ease of use (PE) and attitude (ATT) as the independent variables may be rejected.

The standardised model may be written as:

A.BI =1.431+.092* A.PU + 0.171*A.PE+0.548* A.ATT………….. (model-1)

All regression coefficients were significant (Table C.16, Appendix C). All the Independent variables, namely, attitude (ATT), perceived ease of use (PE) and perceived usefulness (PU)had a significant impact on behavioural intention; therefore, one can reject the null hypotheses of H2a, H4 and H5.

The researcher was able to reject the null hypothesis of there being no relationships between attitude (ATT), perceived usefulness (PU) and PE as independent variables and behavioural intention (BI) as a dependent variable. Hence, we can reject hypotheses H2a, H4 and H5 where the P value is significant at $P<.05$ (Table C.16, Appendix C).

Table 8.19 gives the hypothesis test results and the Beta and P values of the independent variables for the multiple and simple regression models including PE.

Table 8-19Multiple Regression analysis on dependent variable Behavioural Intention (BI) with PE included

Independent Variable	Hypothesis	Regression coefficient for independent variable	Sig. value	Hypothesis test with multiple regression
PU	H4	0.092	0.031	reject nullP = 0.031 P<.05
PE	H2a	0.171	0.000	Reject null P = 0.026
ATT	H5	0.548	0.000	Reject null P = 0.000

Table 8.20 gives the hypothesis test results and the Beta and P values of the independent variables for the multiple and simple regression models not including PE.

Table 8-20Multiple Regression analysis on dependent variable Behavioural Intention (BI) with PE not included

Independent Variable	Hypothesis	Regression coefficient for independent variable	Sig. value	Hypothesis test with multiple regression
PU	H4	0.599	0.000	Reject null P = 0.000
ATT	H5	0.559	0.000	Reject null P = 0.000

Comments:

The correlation (Table 17, Appendix C.17) as well as the regression results indicate that PU, PE and attitude are strongly related to each other. Multiple regressions of BI with PU, PE and attitude reinforce the findings. The results of the multivariate regression analysis evidenced a positive relationship between behavioural intention (BI) as a dependent variable and perceived usefulness, perceived ease of use and attitude as independent variables.

Attitude (ATT) had a strong positive relationship and an impact (B=0.548) on behavioural intention. This result was consistent with findings in the literature that reported use of the attitude construct in the TAM model (Davis *et al*., 1989).According to current results, perceived ease of use (PE) is a stronger determinant of behavioural intention to use than PU. This result is consistent with the findings of Davis *et al*. (1989). Notably, in the current research, the additional hypothesis H2a tested the relationship between ease of use (PE) and behavioural intention to use (BI) and it was subsequently verified.

When, however, the PE is removed from the model; the researcher found a strong significant relationship between behavioural intention (BI) as a dependent variable and IVs perceived usefulness (PU) and attitude (ATT).These results were consistent with the findings of the literature on the TAM model, as well as with Venkatesh &Davis (2000) who also found that PU had a strong impact on BI.

The standardised model may be written as:

A.BI =1.431+.092* A.PU + 0.171*A.PE+0.548* A.ATT…………… (model-1)

Model Summary

Table 8-21 BI model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.850[a]	.723	.720	.39838
a. Predictors: (Constant), A.ATT, A.PE, A.PU				

8.8.2 PART TWO LEARNING STYLES AND TAM MODEL WITH RELATIONSHIPS TO EXTERNAL VARIABLES

8.8.2.1 Learning styles and PU

H18a.The average perceived usefulness score is the same for all four learning style groups.

To test the hypothesis that the average perceived usefulness score is the same for all four learning style groups, the researcher carried out a univariate ANOVA. The results of the ANOVA, shown in Table 8.23, indicate no significant differences (p=0.981) in the scores for perceived usefulness amongst all four learning style groups. Although it appears, that divergers and convergers have higher scores than assimilators and accommodators (see Table 8.22).Such differences, however, were insignificant, as shown in Graph (8.1). The result indicates that in a Libyan university context there is no impact of different learning styles on the perceived usefulness of the BSMC system. Additionally, R^2 at 0.001 indicates that the model explained only 0.1% of variance in PU and the learning styles did not contribute much to the model as a whole (see Table 8.23).

Table 8-22Descriptive PU score for each learning style

Dependent Variable: A.PU

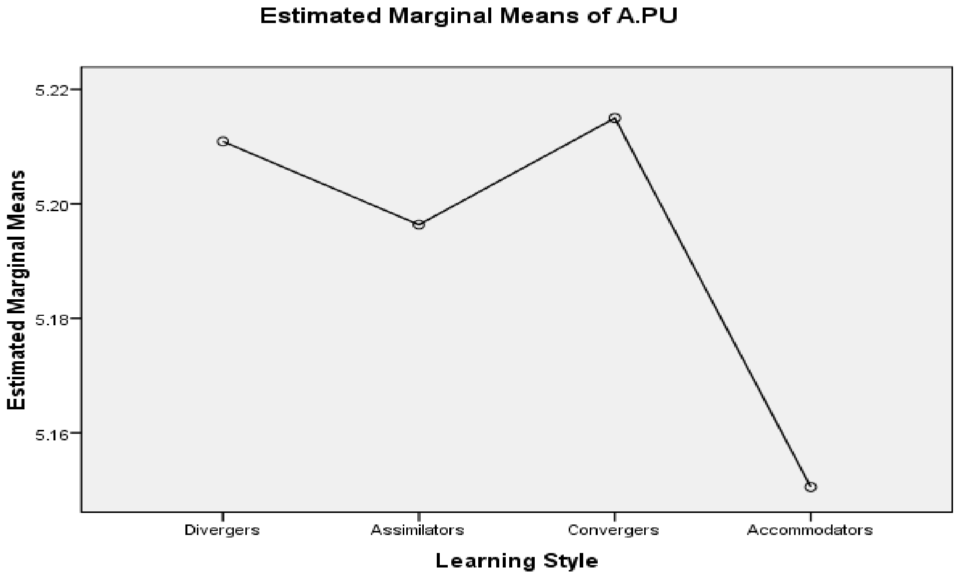
Learning Style	Mean	Std. Deviation	N
Divergers	5.2109	0.96459	98
Assimilators	5.1963	0.98966	73
Convergers	5.2150	0.94329	69
Accommodators	5.1505	1.11363	62
Total	5.1959	0.99351	302

Table 8-23univariate ANOVA of PU scores for learning styles

Dependent Variable: A.PU

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	0.175[a]	3	0.058	0.058	0.981
Intercept	7914.001	1	7914.001	7942.572	0.000
LERNSTYLE	0.175	3	0.058	0.058	0.981
Error	296.928	298	0.996		
Total	8450.361	302			
Corrected Total	297.103	301			
a. R Squared = 0.001 (Adjusted R Squared = -0.009)					

Figure 8-2: Profile Plots



8.8.2.2 Learning styles moderation

H18b.The relationship between various independent variables and PU under the TAM model is moderated by different learning styles.

To determine the moderating impact of each learning style on the relationship, the researcher used two techniques (Pearson correlation and regression coefficients) considering various independent variables and PU as a dependent variable and learning styles as moderated variables. Different models were developed for samples of each type of learning style. The results are shown in Table 8.24 and Table8.25 in the form of comparative correlations and regression models. The table of correlations (Table 8.24) implies that in general all the correlation coefficients are significant for the overall sample as well as for the sub-samples of individual learning styles except for dummy gender. When, however, one compares the magnitude and direction of the correlation coefficients it appears that they are not the same for each learning style. The correlations for certain styles are higher compared to other ones, which may indicate that different learning styles moderate the relationships between the variables involved in the research model. Generally, the pattern shows that correlation coefficients are higher in the case of people with the assimilator style of learning as compared to divergent, with the only exception being PE/SE, which has a stronger correlation coefficient for accommodators.

The moderating impact of each learning style on the regression coefficients (impact) of the research model was also observed as shown in Table 8.25.
From the regression model Table 8.25 comparison, it is observed that subjective norms, job relevance and complexity have insignificant impact on the overall sample as well as for each style of learning and these coefficients are insignificant.

It appeared that the regression coefficient for dummy gender is significantly negative for assimilators but not for other learning styles. This implies that the female assimilators have more negative impact (b=0.131) on PU. In addition, in the case of assimilators, the regression coefficients for PE (b=0.799), dummy social science and self-efficacy all are significant and these three had more impact on PU. In the case of divergent learners, experience has more impact on PU. In addition, in the case of convergers and accommodators, self-efficacy and specialisation show no impact on PU. Thus, overall, it appears that learning styles influence the relationships between the independent and dependant variables of TAM.

Table 8-24Pearson correlation comparisons across learning styles

	Pearson Correlation coefficients of different variables with A.PU moderated by learning style									
	Overall sample n=302	Sig. (1-tailed)	Divergers N=98	Sig. (1-tailed)	Assimilators N=73	Sig. (1-tailed)	Convergers N=69	Sig. (1-tailed)	Accommodators N=62	Sig. (1-tailed)
	A.PU		A.PU		A.PU		A.PU		A.PU	
dummy gender	-.047	.207	.008	.470	-.177	.067	.089	.233	-.112	.194
A.PE	.821	.000	.757	.000	.832	.000	.809	.000	.911	.000
DUMMYNATURAL	.434	.000	.389	.000	.540	.000	.408	.000	.416	.000
DUMMYPROFSSIONAL&APPLIED	.168	.002	.187	.033	.120	.156	.152	.107	.211	.049
DUMMY_SOCIALSC	-.626	.000	-.580	.000	-.658	.000	-.646	.000	-.655	.000
A.SN	.396	.000	.426	.000	.517	.000	.310	.005	.309	.007
A.JR	.506	.000	.493	.000	.523	.000	.528	.000	.498	.000
A.SE	.696	.000	.651	.000	.718	.000	.702	.000	.747	.000
A.CX	-.490	.000	-.506	.000	-.486	.000	-.426	.000	-.532	.000
EXP	.199	.000	.316	.001	.061	.304	.120	.164	.272	.016

Regression coefficients of different variables with A.PU moderated by learning style: a comparison across learning styles.

Table 8-25Moderation of learning styles: a comparison across learning styles

Model	Overall sample		Divergers		Assimilators		Convergers		Accommodators	
	Std. Coefficients	Sig.	Std. Coefficients	Sig.	Std. Coefficients	Sig.	Std. Coefficients	Sig.	Std. Coefficients	Sig.
	Beta		Beta		Beta		Beta		Beta	
(Constant)		.000		.034		.035		.002		.294
Dummygender	.015	.656	.109	.098	-.131	.036	.096	.255	-.040	.509
A.PE	.630	.000	.626	.000	.479	.000	.714	.000	.799	.000
DUMMY-PROFSSIONAL&APPLIED	-.102	.012	.217	.087	-.183	.036	-.034	.675	-.063	.439
DUMMY_SOCIALSC	-.264	.000	.145	.147	-.396	.002	-.192	.132	-.164	.176
A.SN	-.070	.054	-.162	.058	.000	.997	-.151	.072	-.041	.513
A.JR	-.143	.007	-.203	.071	-.146	.184	-.103	.360	-.071	.476
A.SE	.180	.000	.277	.002	.294	.000	.090	.429	.088	.400
A.CX	-.067	.078	-.093	.248	-.039	.550	-.150	.088	.047	.572
EXP	.133	.000	.159	.023	.129	.0491	.104	.261	.128	.035

a. Dependent Variable: A.PU

colours : yellow is the value of p

pink is for the value beta

8.8.2.3 **Learning Style and Perceived Ease of Use PE**

H19: The average perceived ease of use score is the same for all four learning style groups.

To test the hypothesis that the average perceived ease of use score (PE) is the same for all four learning style groups the researcher carried out a univariate ANOVA test. The ANOVA results shown in Table 8.26 indicate that there are no significant differences (p=.565) in the scores of perceived ease of use amongst all four learning style groups.

Although it seems that divergers and convergers have higher scores than assimilators and accommodators (see Table C.20) such differences are insignificant. Confirmation of that result is the R^2 at 0.007, which indicates that the model explains only 0.7% as represented by the very small number (but slightly more with PU) and the learning styles did not contribute much to the model as a whole (see Table 8.26).

As found in the previous analysis of perceived usefulness, there was no significant impact of all four learning styles on perceived ease of use. PE, however, has slightly more impact than PU, which suggests that students perceive the BSCM system as being easy to use instead of actually finding it useful. This may indicate that the design of the system has already considered the ease of use, which encourages students to accept this kind of system. Designers should consider this variance between PE and PU, as they should take into account that the system has to be easy to use as well as being useful for acceptance by the students.

Table 8-26Univariate ANOVA of PE scores for learning styles

ANOVA Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.176[a]	3	0.725	0.680	0.565
Intercept	8392.046	1	8392.046	7866.753	0.000
LERNSTYLE	2.176	3	0.725	0.680	0.565
Error	317.899	298	1.067		
Total	8981.556	302			
Corrected Total	320.075	301			
a. R^2 = 0.007 (Adjusted R Squared = -0.003)					

8.8.2.4 Learning Style and Gender

H20: The percentage of study participants in each learning style group is the same for males and females.

As shown in Table 8.27, the percentage of students with various learning styles is not very different. The highest proportion of the sample of participants was Divergers representing 32.5% of the whole sample, followed by Assimilators at 24.2%, Convergers at 22.8%, and Accommodators at 20.5% of the whole sample. It appears, in Libyan universities, the largest number of students prefers a Divergent learning style but this is limited to the small sample of this study.

Table 8-27Learning styles frequency

Learning Style Frequency

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Divergers	98	32.5	32.5	32.5
	Assimilators	73	24.2	24.2	56.6
	Convergers	69	22.8	22.8	79.5
	Accommodators	62	20.5	20.5	100.0
	Total	302	100.0	100.0	

In order to determine any associations between the percentage of males and females in each group learning style the researcher carried out a cross-tabulation using a chi square test. The chi square test (Table 8.28) indicates that there is no significant association (Pearson Chi-Square $p=0.737 >0.05$, Table 8.29) between gender and each learning style. Thus, the null hypothesis, ‘The percentage of study participants of each learning style are same for males and females’ could not be rejected. Although insignificant, there seems to be a pattern that males and females have almost similar percentages in each learning style group (see Table 8.28).

Table 8-28Cross tabulation of learning styles with Gender

Cross tabulation of learning styles with Gender

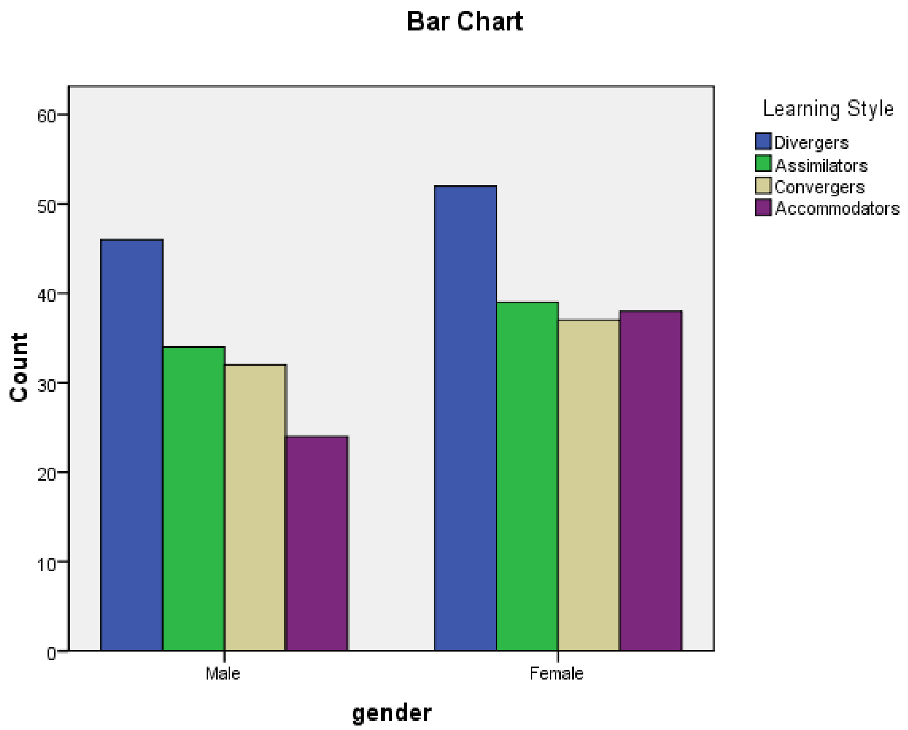
		Learning Style				
Gender		**Divergers**	**Assimilators**	**Convergers**	**Accommodators**	**Total**
Male	Count	46	34	32	24	136
	% within gender	33.8%	25.0%	23.5%	17.6%	100.0%
	% within Learning Style	46.9%	46.6%	46.4%	38.7%	45.0%
Female	Count	52	39	37	38	166
	% within gender	31.3%	23.5%	22.3%	22.9%	100.0%
	% within Learning Style	53.1%	53.4%	53.6%	61.3%	55.0%
Total	Count	98	73	69	62	302
	% within gender	32.5%	24.2%	22.8%	20.5%	100.0%
	% within Learning Style	100.0%	100.0%	100.0%	100.0%	100.0%

Table 8-29Chi-square of learning style with Gender

Chi-Square Tests of Learning Style with Gender

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.266[a]	3	0.737
Likelihood Ratio	1.277	3	0.735
n Linear-by-Linear Association	0.806	1	0.369
N of Valid Cases	302		

Figure 8-3Male and female variation (Bar chart)



8.8.2.5 **Learning styles and specialisation**

*H21.*The percentages of study participants of each learning style are same for students with different specialisations.

To determine any associations between percentages of students with different specialisations and students of different learning styles, cross tabulation and a chi square test was performed. The chi square test (Table 8.31) indicates that there is no significant association (Pearson Chi-Square p=0.488 >0.05) between groups of students with different specialisations and each learning style. Thus, the null hypothesis, the percentages of study participants of each learning style are same for students with different specialisations could not be rejected. This means that different specialisations have nearly the same percentages of students of each learning style (see Table 8.30, Graph 8.3). This indicates that learning styles have no effect on choice of specialisation for study.

Table 8-30Cross tabulation of learning style with Specialisations

Cross tabulation of learning style with Specialisations

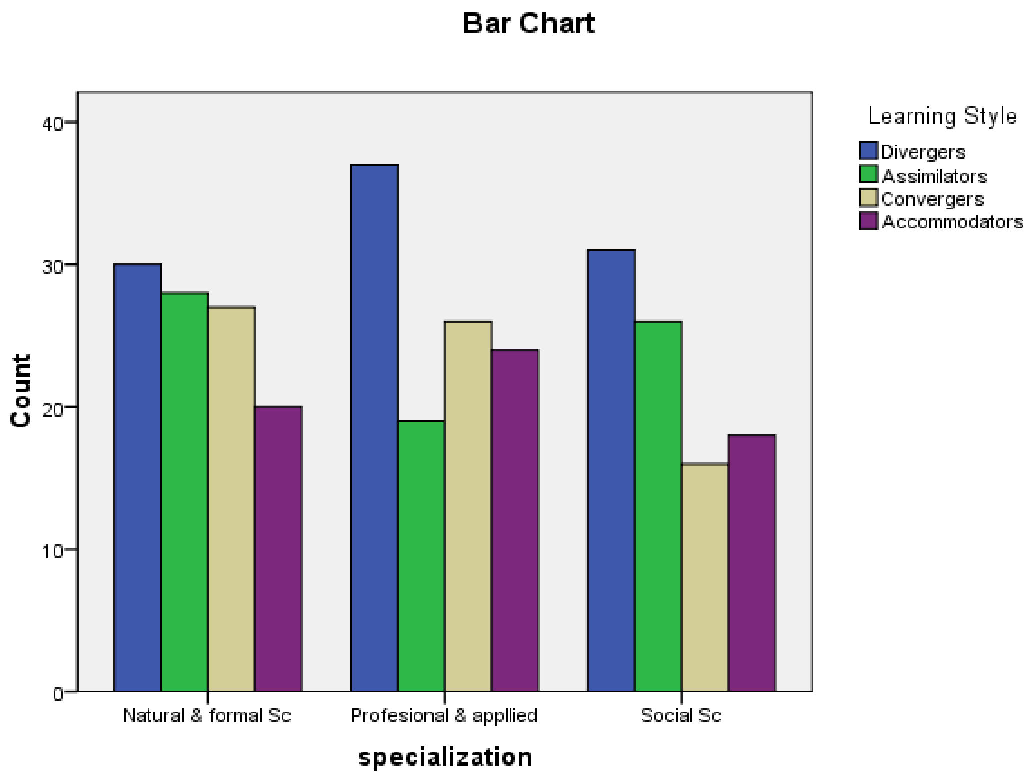
			Learning Style				
			Divergers	**Assimilators**	**Convergers**	**Accommodators**	**Total**
specialisation	**Natural and formal Sc**	Count	30	28	27	20	105
		% within specialisation	28.6%	26.7%	25.7%	19.0%	100.0%
		% within Learning Style	30.6%	38.4%	39.1%	32.3%	34.8%
	Profesional and applied	Count	37	19	26	24	106
		% within specialisation	34.9%	17.9%	24.5%	22.6%	100.0%
		% within Learning Style	37.8%	26.0%	37.7%	38.7%	35.1%
	Social Sc	Count	31	26	16	18	91
		% within specialisation	34.1%	28.6%	17.6%	19.8%	100.0%
		% within Learning Style	31.6%	35.6%	23.2%	29.0%	30.1%
	Total	Count	98	73	69	62	302
		% within specialisation	32.5%	24.2%	22.8%	20.5%	100.0%
		% within Learning Style	100.0%	100.0%	100.0%	100.0%	100.0%

Table 8-31Chi-Square Tests of learning style with Specialisations

Chi-Square Tests of Learning style with Specialisations

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.448[a]	6	0.488
Likelihood Ratio	5.657	6	0.463
Linear-by-Linear Association	0.538	1	0.463
N of Valid Cases	302		

Figure 8-4Specialisation Chart with learning style



8.9 PREDICTIVE PATH MODEL

In order to examine the predictive path model, a multiple regression analysis technique was carried out for each endogenous variable. The endogenous variable is a dependent variable created within a model and therefore, its value is changed by the impacts of the functional relationships in that model (Hair *et al,* 2006). In this case, PU, PEOU, ATT, BI is the endogenous variables whose variance is explained by other ones (independent variables) in the research model. Accordingly, the analysis for each endogenous variable, a multiple regression test was carried out in order to predict what variables included in the model have a direct effect upon it. Variables, which are involved in the proposed hypothesises and join in relationships with one another and affect the endogenous variable are only included in the regression analysis. Therefore, learning styles were excluded. Learning styles have a separate effect and special hypothesises are formulated for its purpose. The results will calculate the beta weights from the regression and considered as a path model (Hensler and Fassott, 2010). The coefficient of R^2indicates the value of variance in the dependent variable, which is explained by the predictor.

8.9.1 ENDOGENOUS PU

The regression analysis result for the endogenous variable perceived usefulness (PU) table (8.32) shows that $R^2$is 0.749 for the model with the influence of the independent variable. The ANOVA Table (8.33) shows the significant relationships of all independent variables on the endogenous variable (PU) with P value <0.05, except gender. Gender was excluded from the model as shown in the ANOVA table and model summery Table (8.33). The coefficient beta of the model with PU as the endogenous variable are significant, as indicated in Table (8.34) except gender and complexity with a P value 0.565 and 0.078 respectively and low beta values 0.15 and 0.067.

Table 8-32R square for dependent variable PU

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.865[a]	.749	.741	.50559
2	.865[b]	.749	.742	.50490

a. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, A.JR, A.PE, DUMMYNATURAL

b. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, A.SE, A.CX, A.JR, A.PE, DUMMYNATURAL

Table 8-33ANOVA for dependent variable PU

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	222.461	9	24.718	96.697	.000[a]
	Residual	74.642	292	.256		
	Total	297.103	301			
2	Regression	222.410	8	27.801	109.057	.000[b]
	Residual	74.693	293	.255		
	Total	297.103	301			

a. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummy gender, A.SE, A.CX, A.JR, A.PE, DUMMYNATURAL

b. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, A.SE, A.CX, A.JR, A.PE, DUMMYNATURAL

c. Dependent Variable: A.PU

Table 8-34coefficient for dependent variable PU

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
Model	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	1.525	.380		4.014	.000					
dummygender	.029	.065	.015	.446	.656	-.047	.026	.013	.809	1.236
A.PE	.607	.047	.630	12.946	.000	.821	.604	.380	.363	2.754
DUMMYNATURAL	.570	.131	.274	4.366	.000	.434	.248	.128	.219	4.567
DUMMYPROFSSIOAL&APPLIED	.358	.099	.172	3.623	.000	.168	.207	.106	.380	2.632
A.SN	-.099	.051	-.070	-1.936	.050	.396	-.113	-.057	.667	1.498
A.JR	-.083	.030	-.143	-2.736	.007	.506	-.158	-.080	.313	3.193
A.SE	.191	.047	.180	4.100	.000	.696	.233	.120	.448	2.233
A.CX	-.052	.030	-.067	-1.767	.078	-.490	-.103	-.052	.596	1.679
EXP	.119	.030	.133	3.967	.000	.199	.226	.116	.768	1.302

a. Dependent Variable: A.PU

8.9.2 ENDOGENOUS PEOU

The regression analysis result for the endogenous variable perceived ease of use (PEOU) table (8.35) shows that R^2 is 0.637 for the model with the influence of the independent variable. The ANOVA Table (8.36) shows the significant relationships of all independent variables on the endogenous variable (PEOU) with P value <0.05 with a partial exclusion of gender, (Exp), (CX) and (JR), which are excluded from the model as shown in the ANOVA table and model summery Table (8.35) because they have shown an insignificant relationship in the model. The coefficient beta of the model with PEOU as the endogenous variable are significant as indicated in Table (8.36) except (JR), (EXP), and (CX). Gender, however, is partially excluded with P value 0.06 this is because female perceive ease of use was more than male as described in the previous regression analysis in part two. See table (8.37) for the coefficient beta for all independent variables, which show the low beta for those variables that were excluded.

Table 8-35R square for dependent variable PEOU

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.798[a]	.637	.627	.62979
2	.798[b]	.637	.628	.62872
3	.798[c]	.637	.629	.62782
4	.798[d]	.636	.630	.62737

a. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, A.JR, DUMMYNATURAL

b. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, DUMMYNATURAL

c. Predictors: (Constant), DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, DUMMYNATURAL

d. Predictors: (Constant), DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, DUMMYNATURAL

Table 8-36ANOVA for dependent variable PEOU

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	203.862	8	25.483	64.248	.000[a]
	Residual	116.213	293	.397		
	Total	320.075	301			
2	Regression	203.859	7	29.123	73.673	.000[b]
	Residual	116.216	294	.395		
	Total	320.075	301			
3	Regression	203.799	6	33.966	86.175	.000[c]
	Residual	116.277	295	.394		
	Total	320.075	301			
4	Regression	203.571	5	40.714	103.441	.000[d]
	Residual	116.504	296	.394		
	Total	320.075	301			

a. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, A.JR, DUMMYNATURAL

b. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, DUMMYNATURAL

c. Predictors: (Constant), DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, DUMMYNATURAL

d. Predictors: (Constant), DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, DUMMYNATURAL

e. Dependent Variable: A.PE

Table 8-37coefficient for dependent variable PEOU

Coefficients[a]

Model	Unstandardized		Standardized			Correlations			Collinearity	
	B	Std.	Beta	t	Sig.	Zero-	Partial	Part	Tolerance	VIF
1 (Constant)	.059	.473		.125	.901					
dummygender	-.223	.080	-.108	-2.793	.006	-.114	-.161	-.098	.830	1.204
DUMMYNATURAL	.653	.158	.302	4.131	.000	.408	.235	.145	.232	4.315
DUMMYPROFSSIOAL&APPLIED	.582	.118	.270	4.920	.000	.184	.276	.173	.411	2.431
A.SN	.434	.058	.293	7.420	.000	.551	.398	.261	.793	1.261
A.JR	.003	.038	.006	.092	.927	.526	.005	.003	.313	3.193
A.SE	.436	.052	.396	8.373	.000	.693	.439	.295	.555	1.802
A.CX	-.022	.037	-.027	-.591	.555	-.446	-.034	-.021	.596	1.677
EXP	.013	.037	.014	.337	.736	.063	.020	.012	.768	1.301

a. Dependent Variable: A.PE

8.9.3 ENDOGENOUS ATT

The regression analysis result for the endogenous variable perceived usefulness (ATT) Table (8.38) show that R^2 is 0.447 for the model with the influence of the independent variable pf PU & PEOU. The ANOVA Table (8.39) show the significant relationships of all independent variables on the endogenous variable (ATT) with P value <0.05. The coefficient beta of the model with ATT as the endogenous variable is significant as indicated in Table (8.40). As indicated the beta of PU and PEOU are 0.416 and 0.284 respectively. The value of the beta of PU is higher than PEOU. This is because the influence of PU is a stronger determinant than PEOU on ATT. PEOU, however, was found to be a stronger determinant than PU on the BI as described in part two.

Table 8-38R square for dependent variable ATT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.669[a]	.447	.444	.60043

a. Predictors: (Constant), A.PE, A.PU

Table 8-39ANOVA for dependent variable ATT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	87.304	2	43.652	121.082	.000[a]
	Residual	107.794	299	.361		
	Total	195.097	301			

a. Predictors: (Constant), A.PE, A.PU

b. Dependent Variable: A.TT

Table 8-40coefficient for dependent variable ATT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1 1	(Constant)	2.578	.192		13.416	.000					
	A.PU	.337	.061	.416	5.521	.000	.649	.304	.237	.326	3.066
	A.PE	.222	.059	.284	3.777	.000	.625	.213	.162	.326	3.066
	(Constant)	2.578	.192		13.416	.000					

a. Dependent Variable: A.TT

8.9.4 ENDOGENOUS BI

The regression analysis result for the endogenous variable perceived usefulness (BI) Table (8.41) shows that $R^2$is 0.723 for the model with the influence of the independent variable PU, PEOU and ATT, because the researcher included PEOU in the path directly to BI to examine the influence of PEOU. The ANOVA Table (8.42) show the significant relationships of all independent variables on the endogenous variable (ATT) with P value <0.05. The coefficient beta of the model with BI as the endogenous variable is significant as indicated in Table (8.43). As indicated, the beta of PU and PEOU and ATT are 0.121, 0.234 and 0.585 respectively, the value of beta of PU is shown. The lowest and indicates that PEOU is a stronger determinant than PU. ATT, however, is the stronger determinant of BI, which is consistent with previous studies.

Table 8-41R square for dependent variable BI

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.850[a]	.723	.720	.39838

a. Predictors: (Constant), A.ATT, A.PE, A.PU

Table 8-42ANOVA for dependent variable BI

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	123.417	3	41.139	259.219	.000[a]
	Residual	47.294	298	.159		
	Total	170.711	301			

a. Predictors: (Constant), A.ATT, A.PE, A.PU

b. Dependent Variable: A.BI

Table 8-43ANOVA for dependent variable BI

Coefficients[a]

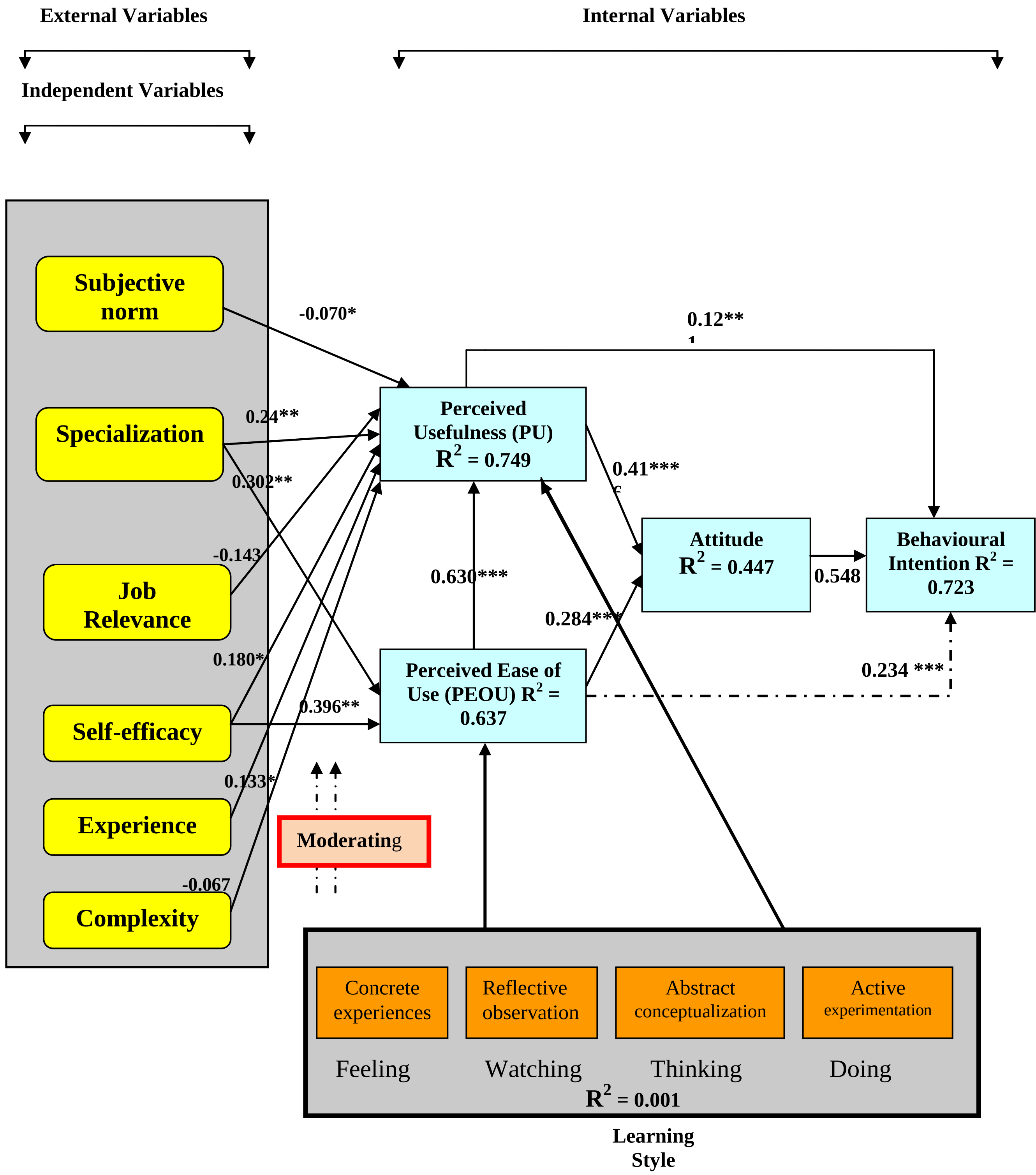
Model	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	1.431	.161		8.865	.000					
A.PU	.092	.042	.121	2.167	.031	.694	.125	.066	.296	3.379
A.PE	.171	.040	.234	4.287	.000	.700	.241	.131	.311	3.212
A.ATT	.548	.038	.585	14.273	.000	.811	.637	.435	.553	1.810

b. Dependent Variable: A.BI

Having analysed the predictive path model for each endogenous variable using multiple regressions, Figure (8.7) illustrates the predictive model that gives the path of the variables that influence it. The path shows the coefficient beta (β) value and the (R^2) which is the variance of each endogenous variable that it holds. The gender construct is excluded because it violates the research model assumption. Most the antecedents of PU show significant and can contribute to the variance of the model except job relevance and complexity. The only antecedents of PEOU to show significant relationships are (SP), (SN) and (SE), which the study has already hypothesised. The other antecedents of PEOU gender, (JR), (CX) and (EXP) do not have significant relationships with POEU and have not been hypothesised during this study. This is because the researcher's expectance based on the in-depth review of the literature of previous studies in technology adoption. The regression model validated the result that the specialisation construct had a direct relationship with PU and PEOU as well as the subjective norms and possibly the latter have a direct impact on PEOU, which has been ignored by previous studies. In this study, the researcher can reveal that a subjective norm (SN) has a significant impact on perceived ease of use (POEU) within the Libyan context. Additionally, the regression result give evidence that self-efficacy can contribute to the variance of the model.

The predictive model accounts for 72% of the variance in behavioural intention (BI). In addition, the model accounts for 44% of the variance in attitude towards use (ATT). This variance was explained by both beliefs constructs perceived usefulness, perceived ease of use and their antecedents.

Figure 8-5Predictive model amid R2 and path coefficient



***p< 0.001, **p< 0.01, *p< 0.05, P>0.5

8.10 CONCLUSION

The aim of this chapter was to validate the proposed research model and test the hypotheses by using an appropriate statistical approach that included linear and multiple regression models. The chapter started by examining the data analysis to ensure it is reliable. It discussed the questionnaire analysis, analyse the demographic profile and moved to assess the normality and outlier data. The chapter assessed the measurement model to establish the construct reliability and validity of the data. The appropriate techniques required for reliability and validity were carried out, such as, internal consistency and factor analysis to ensure the validity of the data by using SPSS 16. The measurement methods were examined and found to satisfy the values of the suggested criteria. The results, therefore, proved that all the constructs satisfied the criteria for reliability and the instruments that were used were valid. The chapter then, justified the methods that been selected to validate the research model and to test the proposed hypothesises. All the proposed twenty-one hypothesises were examined using suitable techniques that tested the nature of each one. The learning styles hypothesises were established and were shown not have any significant affect on the model. They, however, can play an important role because they are able to moderate the model between various independent variables and belief constructs that impact upon the intention to use VLE. The other seventeen hypothesises were also examined and the results show that some hypothesis are not supported and can violate the research model. The chapter then, presented the predictive path model, which provides the direct and indirect path for each endogenous variable.

The next chapter will discuss the key findings by summarising the results of the analysis to demonstrate the reasons behind every hypothesis involved. This will assist to draw the conclusion of the research, presents the limitation of the research and draw suggestions for the future and further research possibly for this area of investigation.

9 DISCUSSION

9.1 INTRODUCTION

The previous chapter validated the research model VLEAM of students' perceptions of VLE and tested the formulated research hypothesises using a variety of techniques, such as, a Multiple Regression model. Having achieved the statistical analysis and formed the research results the present chapter aims to discuss the key findings that affect students' acceptance of VLE. The chapter uses the results of the quantitative analysis to provide better explanations of the issues that appear during the discussion and link any gaps in understanding student attitudes towards using VLE. It is expected that this investigation will provide a better understanding of the all antecedents of VLE acceptance. Each factor will be discussed in terms of its impact on the model and provide reasons for its impact/non-impact. The chapter provides a summary of the research hypothesises and discusses the validated model by describing the significant paths of each construct. The chapter finally, concludes the discussion.

9.2 DISCUSSION AND SIGNIFICANT FINDINGS

This section discusses the findings mentioned in chapter eight. The discussion is split into three parts. The first part discusses the basic TAM model. It discusses the main drivers (PEOU, PU and ATT) of technology adoption. The second part describes the effects of seven external factors (chapter eight part two) that affect the adoption of technology. The third part further extends the model and it entails the effect of learning styles on technology adoption.

The regression analysis has been used to evaluate the twenty-one hypothesises that related to various constructs under the extended TAM model for VLE. The findings of the regression analysis presented in chapter eight reveals that perceived useful (PU) and its antecedent subjective norms, specialisation, self-efficacy, experience and perceived ease of use (PE) have significant impact directly and indirectly on the intention to use VLE by Libyan university students. The results confirmed that perceived ease of use (PE) and its antecedent specialisation and self-efficacy have indirect impact on the intention of using VLE. The study reveals that all four learning style types have an insignificant impact on the research model and no influence upon the intention to use VLE. However, learning styles, however, can moderate the value of the external factors that influence the process of adoption. The following sub-section address the significant finding of the empirical work through the analysis of the research hypothesises.

9.2.1 TAM- THE RELATIONSHIPS BETWEEN BELIEFS CONSTRUCTS, ATTITUDE AND INTENTION TO USE VLE

The research study supported the positive relationship between perceived usefulness and attitude towards use as well as the intention to use when perceived ease of use was excluded from the analysis as one of the independent variables related to attitude. The study found that perceived usefulness has a greater impact on intention to use compared to attitude to use as described in chapter eight part two ($\beta= 0.377$, $p<0.001$; $\beta= 0.599$, $p<0.001$ respectively). These findings are consistent with previous studies (Venkatesh & Davis, 2000; Seyal *et al*., 2002; Yu *et al*., 2005; Chau & Hu, 2001; Vrielink, 2008; AL-gahtani, 2008; Chuttur, 2009). It has been reported that VLE is useful for perspective of students when they engage with their learning. A study by Yu *et al*. (2005) established perceived usefulness as the best predictor of intention to use VLE, both directly and via attitude. Furthermore, Sumak *et al*. (2010) found that the best determinant of intention was perceived usefulness. On the other hand, when the researcher included perceived ease of use and perceived usefulness together in the analysis, the results became different and interesting, which implied that usefulness has insignificant impact on behavioural intention. Perceived ease of use, however, has more impact on attitude and intention to use, which is contrary with what has been reported by most TAM research, since the usefulness term reflects students' beliefs to what extent using VLE is beneficial compared to face-face learning (van Raaij and Schepers, 2008).

The study found that perceived ease of use has almost three times more impact on attitude towards using VLE as compared to perceived usefulness ($\beta= 0.630$, $p<0.001$; $\beta= 0.222$, $p<0.001$ respectively). The hypothesis was analysed and is consistent with previous studies (Wang & Wang, 2008; Chatzoglou *et al.*, 2009) reportedthat both usefulness and ease of use are important determinants of attitude towards VLE. The current study based on multiple regression analysis found that perceived ease of use has a greater impact with respect to Libyan students. Further investigation found that perceived ease of use has also more impact on behavioural intention to use compared to perceived usefulness. This can be seen by their coefficient ($\beta= 0.171$, $p <0.001$; $\beta= 0.092$, $p <0.004$). This result is a new finding, not explored in any previous research. Most previous studies assumed and found that perceived usefulness is more important and determines attitude and behavioural intention to use (Sun, 2003; Poelmans *et al.*, 2008; Sumak *et al.*, 2010; Jan and Contreras, 2011) but in the case of Libya perceived ease of use was found more important.

One possible clue is that any new idea or technology may be adopted because of its novelty, trendiness or social preferences. This may indicate that luxury products or services are not always consumed for utility purposes but for hedonistic consumptions (Khan *et al*, 2004). In the latter case the product or technology is perceived as hedonistic or novel and people may adopted or use it without looking at its physical or body utility. Therefore, for such products or technologies easy availability, ease of usefulness and social norms may have a greater impact compared to their utility. For example, in the case of video games, most young people use them because the game is trendy, used by friends and appealing entertainment but they may be used for hedonistic consumption and not just because it is physically useful or for learning. “Consumers are often faced with these types of choices between hedonic and utilitarian alternatives that are at least partly driven by emotional desires rather than cold cognitive deliberations” (Khan *et al*, 2004, p1).This needs further exploration, that is, why perceived ease of use is important for attitude.

Another plausible reason these days is that the use of the Internet is considered easy and students may benefit from learning through it. Many students achieved enough experience by navigating to education sites, especially those related to e-learning during their studies. The majority of students may have responded from their feeling that using VLE is easy to use than usefulness. It seems various Internet usages, such as, spent a long time and higher experiences coalesce into a higher perceived ease of use of VLE and to a lesser extent of perceived usefulness. A high-perceived ease of use thereafter determines a high attitude and directly influences intention to use.

Libyan students as well as instructors (lecturer) have less awareness and limited experiences with the VLE. The significant differences found between perceived ease of use and perceived usefulness of VLE (see section 8.8.2 chapter Eight) may be related to this. As the system is still in its first stages of development, the interaction of students with the functionality provided by the system is limited, such as, accessing course content, which requires where the relevant material to be uploaded by the instructors. More specifically, at the time of this research, most teachers had not participated in online learning by providing all the relevant materials that students need and from which they are expect to benefit. Students may find it not useful to access relevant course content, which they assumed important to their studies. These negative responses will affect their perceptions towards the benefits of using the system and will reduce their attitude towards its usefulness. The researcher noticed that most instructors who had started to use VLE were loading course material by converting their existing paper-based lectures notes into simple web formatted files, such as, power point document. This is because instructors are not experienced with the new learning environment. They have the wrong perception of transferring what is being taught in the traditional method environment into the online learning format without actually taking into account the instructional design requirements for VLE as new environment learning.

Transferring existing paper-based material into a web format and uploading it for students to benefit when they access VLE does not guarantee an effective and successful implementation and in turn reflects on the beneficial and usefulness of the system. With this in mind, as highlighted by Lu *et al.* (2007) online learning should offer lecturers a new medium of instruction to deliver teaching and learning material in new and exciting ways. By converting text-based notes into an electronic learning environment without considering the aspects of the learning process has led to a disjointed approach. Furthermore an unnecessary and unrelated content may as well result in an information excess, which will cause students to lose interest. Consequently, such negative concerns may explain why the outcome of usefulness exerted less impact than anticipated. In order to understand further the perceptions of students towards the specific tasks performed by the users, additional research is recommended to explore the interactions performed by users in all aspects of VLE in general use.

Another possible statistical reason is that the sample consisted of a majority of students from technical backgrounds (natural and applied 65%) and for them using VLE or technology is easy to use. This could be predicted based on the variable related to specialisation that may have moderated the relationship of attitude with perceived ease and perceived usefulness. As a result, the ease of use has become the main determinant of attitude and behavioural intention to use.

A further plausible explanation is the multi-collinearity problem that occurred between the three independent variables usefulness, ease of use and attitude. Multi-collinearity can have significant effects on the outcomes of the regression analysis. It makes determining the contribution of each independent factor complicated, therefore, absence of multi-collinearity is needed. Another study may use alternative techniques, such as, a Structure Equation Model (SEM).

The study also found that student attitude has a significant impact on intention to use VLE (β= 0.559, $p<0.001$). As indicated in both analysis linear and multiple regression, attitude has strong relationships with intention (β= 0.835, $p<0.001$; β= 0.559, $p<0.001$ respectively). Where only Attitude could explain (65%) of variance in behavioural intention (linear regression chapter eight part one) but comprised the attitude towards of use, perceived usefulness and perceived ease of use and if they are taken together could explain (72%) of variance in the behavioural intention to use (Multiple regression chapter eight part two). Obviously, this indicates that attitude has a much greater impact on behavioural intention as compared to constructs of the beliefs. Numerous studies have reported that attitude towards use is a strong determinant of intention to use. These findings are in line with previous TAM literature (Lu *et al*., 2003; Yu *et al*. 2005; Ha & Stoel, 2009). Sharp (2007) has reviewed various articles related to development, extension and application of technology acceptance and found that most studies revealed that attitude was the strongest determinant of intention to use IS. On the other hand, he found few studies that consider the role of attitude is not important, for example, Hu et al., (2005). Brown et al., (2002) admitted this fact but stated that it depended on the matter is that employed, for example, will intend to use the system in order to maintain their job despite their attitudes either positive or negative towards the system. He further highlighted that the importance of attitude is frequently associated more to job satisfaction, loyalty to managers and as prevention to system damage. Owing to the fact that attitude as a factor serves as a significant determinant of intention of use either mandatory or voluntary. A consistent finding from prior research is that user attitude toward new technology is a key factor for successful deployment (Davis et al., 1989; Mathieson, 1991; Adams et al., 1992). Consistent with these studies, the findings of this study confirmed the fact that attitude was the most significant driver for student acceptance and the best predictor of intention to use VLE.

According to Ajzen (1991), attitude is defined as the extent to which an individual has a positive or negative assessment about certain behaviour. This outcome is not surprising since the majority of students have the ability and experience to use the internet (Swesi, 2008). Subsequently, their familiarity about the usage of internet applications and how they work along with their existing online proficiencies may encourage them to believe the new system VLE is favourable and complementary to face-to-face learning and they may believe accessing the system is a means of keeping them connected with peers, teachers and updated information. Subsequently, they have the tendency to extend positive evaluations of VLE. Of these motivations, attitude is revealed by this study to be strongest predictor of intention to use VLE and is can lead to understanding the users' perceptions of technology use.

The findings as per the view of theory of planed behaviour (section 3.2.2) indicate that attitude is the direct determinant of behaviour intention. Attitude itself is influenced by perceived usefulness and perceived ease of use. Further, behaviour intention is also explained by perceived behaviour control and social norms. In the current study, TAM did not explore the impact of perceived behaviour control. The reader may also note that behaviour intention may not translate into actual actions for using VLE. Hence, future research needs to explore the relationships between actual usage behavioural control, intention and attitude.

In summary, this section of the study found that the VLE is preferred because it is easy to use and the students believe that easiness means VLE is more useful. This leads to a positive attitude and in turn they are willing to use VLE. There seems to be some overlap between constructs of perceived ease of use and perceived usefulness or there is some commonality /similarity between concepts of easiness and usefulness. This is indicated by a strong correlation between PEOU and PU (chapter eight parts one & two). The students may use/understand these two constructs as substitutes for each other. In other words, students are willing to adopt beneficial (hedonistic) VLE even if it is not so useful (utility) now. With the abovementioned discussion, one may infer that basic the TAM model cannot fully explain the adoption of VLE. The researcher, therefore, extended the TAM to include external variables and learning styles.

9.2.2 THE RELATIONSHIPS BETWEEN PU & PE AND EXTERNAL VARIABLES.

This section discusses the impact of seven external variables (Gender, Subjective Norms -SN, Specialisation-SP, Job Relevance-JR, Self-efficacy-SE, Experience-EXP and Complexity-CX) on perceived usefulness and perceived ease of use.

Gender

As discussed in chapter eight, gender has no impact or relationship with perceived usefulness or perceived ease of use (β= 0.015, p>0.005 (0.656); β= -0.108, p>0.001 (0.06) respectively). This finding is inconsistent with the findings of the TAM literature, which reported differences between males and females towards technology use, specially its impact on perceived ease of use (Teo & Lim, 1996; Venkatesh & Morris, 2000; Neuforn, 2007; Wang & Wang, 2008). Milis *et al*. (2008) has reported differences between males and females in their acceptance of VLE. The previous research, however, expressed mixed findings about the work of some researchers who found gender had an impact on the adoption of technology and those that did not. The assumption that gender influences adoption is based on gender differences due to social culture or technical factors. In the case of Libyan students the current study could not established the impact of gender differences on perceived usefulness or perceived ease of use of VLE. This could be because for a multiplicity of reasons. Therefore, one needs to check if is there any social culture or technical knowledge-based difference between male and female in Libya.

Further, some recent studies have reported that gender differences in computer and internet use are declining with the time (Tsai & Lin, 2004; Kay, 2006; Milis *et al*. ,2008). With respect to Libyan students, they may be social cultural differences between males and females but because of education, technical knowledge-based differences are declining. Over last two decades, female enrolment in Libyan colleges and universities has increased. In addition, there has been greater daily use of technology in colleges and universities. All these developments may have led to a narrowing in the difference between male and female students. Therefore, no gender differences with respect to its impact on the research model were found.

According to the results of gender's impact, this study provides evidence that male dominance in different aspects of IS acceptance, particularly VLE has decreased. The impact of technology on society over a single decade has changed the perspectives of this generation and has nearly managed to close the gender gap due to the possible reasons ascertained above. The above finding can be useful for instructors who can plan future integration of VLE into the classroom environment as they can ignore gender issues. This means reduce the tasks by educators on developing VLE. Instructors can direct their intentions to design a curriculum for e learning that focuses on the construct of 'usefulness' as discussed in this study. Overall, the study suggests eliminating the gender construct from the research model or carry out research on a large sample to explore the impact of gender with the respect to the interactions of students with the different functions of VLE.

Subjective norms

The researcher found that subjective norms have a significant impact on perceived usefulness and perceived ease of use of VLE (β= -0.070, $p<=0.005$ (0.05); β= 0.293, $p<0.005$). These findings are consistent with previous studies on adoption (Venkatesh and Davis, 2000; Chang &Cheung, 2001; Yu *et al*., 2005; van Raaij & Schepres, 2008). Subjective norms act as social guide or pressure from peers or friends or member of society. In a collective culture, people are less independent and they want to share information and seek the opinions of others before they decide to choose or adopt product services or technology (Hofstede, 1984). Therefore, in a collective culture like that of Libya students would be influenced by what their friends etc… told them. Students respond to social norms using VLE in order to maintain a favourable image within their group or family.

The Libyan culture is fairly uniform (religion) and considered a collectivist society (Hofstede, 1984), where individuals influence each other by performing certain actions. The family, therefore, retains and exercises a significant influence in these societies. As a result, most participants responded positively towards this construct. Most of the values (respondents' feedback value in the questionnaire) were between three and four and this is why the relation outcome is weak for both belief constructs but significant. Parents still have considerable influence on their children regarding their educational interests, however, with the daily use of technology by students the influence of family will diminish with time.

Subjective norms can only become insignificant in technology adoption if acceptance is voluntary and not compulsory (Venkatesh *et al.,* 2003). At Libyan universities, however, VLE is compulsory. Teachers, instructors and university policy make it necessary for the students to use VLE. Hence, they have to follow the norms set by the teacher and the policy makers and fellow students.

The study also revealed that the impact of subjective norms on ease of use was almost four times than the impact on usefulness although it was not hypothesised in the research model. In other words, subjective norms have negligible effect on perceived usefulness. This may be because students learn to use the new technology from their peers and this leads to social compliance and internalisation of the learning. Social learning means believing that it is easy to learn. Hence, students in Libya find it easy to learn VLE due to social learning from peers and then social compliance. Usefulness (hedonistic versus utility), however, is not the main reason for adoption as discussed in part one of this chapter. According to the research's findings, the subjective norm was found to be significant with respect to both usefulness and ease of use. Thus, the study suggests retaining the path of the construct between subjective norm and usefulness and including the subjective norm and ease of use as a new path.

Specialisation

Theoretically, it is expected that the respondent's specialism should have some impact on perceived usefulness and perceived ease of use of VLE. The study found that specialisation had a significant positive impact on perceived usefulness and perceived ease of use of VLE in the Libyan university ($\beta = 0.274$, $p<0.001$; $\beta = 0.302$, $p<0.001$). Students with a social science background perceived VLE as comparatively less useful compared to students of natural and formal science and professional and applied courses. In other words, students with technical backgrounds (Nature and Formal) perceived VLE most useful. Furthermore, the comparatively small value of the coefficients of the dummy variables (natural, applied, and social) and the large value of the constant term in the regression (chapter eight part two), implied that there must be some other independent variables hiding inside the constant term that explains the perceived ease of use and usefulness. Small value for the coefficient of determination also reinforced that specialisation could explain only 40% of the variance in perceived ease of use and usefulness.

The researcher further explored the joint effect of specialisation and other independent variables using multiple regressions. This again evidenced that specialisation has a positive impact on perceived ease of use and usefulness. The specialism of the student leads to more awareness and knowledge of technology or VLE. Thus, students with natural science and professional specialism have a more positive impact on their perceived ease of use or perceived usefulness. In summary, the researcher found that students with computer related backgrounds had a maximum impact on their perceived usefulness and perceived ease of use of VLE. More details of this particular aspect of the discussion were presented in the previous chapter (chapter eight part one linear regression). In summary, this study give empirical evidence that student specialism played a vital role in their perception towards utilising VLE.

Job relevance

The study found that job relevance has a slightly significant but very small impact on perceived usefulness ($\beta = -0.07$, $p<0.05$). These findings are consistent with previous adoption studies (Venkatesh & Davis, 2000; Hart & Porter, 2004; Kim, 2008)with only difference being that the impact of job relevance is very small in our case. Job relevance leads to usefulness because if some technology is relevant to a student's work they will defiantly adopt it for their benefit as rational consumers. The effect of job relevance on perceived usefulness was found to be small and there was no significant impact of job relevance on perceived ease of use ($\beta = 0.06$, $p>0.05$) in Libyan students and this phenomenon needs to be explored further. One explanation can be that if technology, like VLE, is relevant to their work it itself implies that it is useful but a technology relevant to work does not necessarily makes it easier to use unless there is learning due to social norms or/and improvement in self-efficacy to use a technology. Therefore, job relevance may have some impact on perceived usefulness and perceived ease of use of VLE. The study warns that instructors and university decision makers should be aware of the importance of this construct, which reflects the mirror of design for VLE for educational related purposes. In other words, VLE should be perceived as a related purposeful act between students and instructors.

This finding may be consistent with the views of many educational technologists and researchers who disdain the lack of educational innovation, especially the developed countries, despite the spread of the VLE in most educational institutions (OECD, 2005). There are a number of accusations frequently raised about VLE's most popular e learning programmes, particularly, the commercial ones because they just focus on content. There is a lack of strong pedagogy and they are designed based upon the teacher-classroom model. They cannot cover the requirements of diverse subject areas; they are not compatible and cannot exchange content between them. These, as a result, may cause students to feel that the use of VLE is not relevant to their study and does not meet their needs, despite its benefits.

Self-efficacy

The findings of the current research reveal that self-efficacy has a significant impact on both perceived usefulness and perceived ease of use (β= 0.180, $p<0.01$; β= 0.396, $p<0.00$, respectively). These significant impacts are consistent with previous IS studies (Compeau *et al*., 1999; Agarwal *et al*., 2000). The current study found that self-efficacy has a dual impact on ease of use as compared to usefulness. In other words, self-efficacy improves ease of use much more than perceived usefulness. This finding was consistent with other studies, which found similar results (Lee *et al.* (2002); Roca *et al.* (2006); Wu *et al*., 2008; Reid& Levy, 2009; Babic & Jadric, 2010; Liu; 2010). In the context of e-learning, for example, Roca *et al.* (2006) included self-efficacy in their model to examine the capability of students' willingness to use e-learning services. They hypothesised that the variable will only influence ease of use. The findings found that the self-efficacy is strong determinant of e-learning indirectly via ease of use.

One of the interesting outcomes of this research is that both self-efficacy and subjective plays vital roles in affecting attitude towards the use of VLE along with behavioural intention to use VLE. One plausible reason for the significant impact may be justified by motivational theory (Bandura, 1994). According to his theory of social motivation, higher self-efficacy produces an active learning process, while, subjective norms under the effect of social pressure are engaged in reply in recognition of other related people. Under this theory, VLE self-efficacy may be considered an intrinsic motivational variable and subjective norms an extrinsic motivational variable that could assist the students to self-adjust and echo their motivation towards VLE. In Libya, usually students are encouraged to use technology widely in order to catch up with social change affected by technology.

The findings imply that students who are confident in connecting to technology are keener to use the VLE system and can interact with it. Most students in Libyan universities, however, have no knowledge or experience of using VLE because it is a newly introduced system. The positive and significant finding, described above, may be correlated to their capabilities to interact with different computer applications and to their experience of using the internet, which encourages them and became confident to engage and interact with the VLE system. Womble (2008) who stated that individuals with high computer usage and self-efficacy showed confidence in their ability to control their destiny when using IT confirm this finding. Previous studies have found that higher student confidence leads to greater and continued engagement with technology. With experience and exposure self-efficacy improves and this effects belief in ease of use or and usefulness. Whenever students have developed confidence in themselves, the greater has been the ability to use VLE effectively, regardless of any other factors. The study confirmed Bandura' view and revealed that the self-efficacy construct was found to be one of the most important independent variables that determines the intention to use VLE in the context of the educational setting in Libya. This was also confirmed in the organisational environment setting by Lopez and Manson (1997). According to its importance as a factor, the study suggests to retain the construct as an independent variable in the proposed model.

Experience

The inconsistency of findings that appeared in previous studies, directed the current research to examine the influences that affect usefulness and ease of use by conducting multiple regression techniques. Students' prior experiences were found to significantly influence perceived usefulness ($\beta= 0.133$, $p<0.01$). It, however, has no impact on ease of use as expected ($\beta= 0.014$, $p>0.736$). This finding is consistent with prior studies (Igbaria *et al*., 1995; Taylor & Todd, 1995; Ong et al., 2004; Lau & Woods, 2009). The study found that students with two or more years of experience perceived VLE more usefulness and easy. A small value of R^2,however, means that experience could explain only 3% of the variance in perceived usefulness and there may be other reasons beyond experience that explain perceived usefulness of VLE in Libyan students. This small but significant impact of experience on perceived usefulness is because only students with computer related backgrounds responded to this construct. Students with computer background will have some experience and so they perceive VLE useful to them.

As highlighted by Chang and Tung (2008) experience has a strong impact on perceived usefulness of VLE when students have gained enough experience with its use. Therefore, this study suggests further investigation into the role of experience, its impact on changing students' perceptions and beliefs over time, especially with students whose specialism is less likely to involve engagement with technology. Students may accept VLE within a short time and install the technology on their own systems, however, they may take more time to adopt or use the technology because they need time to acquire sufficient concrete experience of VLE. There may be some relationship between experience, specialisation and self-efficacy. These issues need to be investigated further in the Libyan context. The study indicated that students without a computer background perceive VLE less easy and useful because of its complicated functionality; however, with over time students may change their perceptions towards the technology.

Complexity

The current study found that perceived complexity has an insignificant impact on perceived usefulness (β= -0.067, $p>0.078$). This indicates that complexity is not a strong determinant of intention to use VLE. This result was natural since most students perceive the system easy to use. Rogers (1983) define complexity as the degree to which innovation is perceived as being difficult to use and pointed out that the complexity can be seen as opposite to ease of use, so complexity should negatively affect usefulness. This finding is inconsistent with the findings of previous IS research (Webster & Martocchio, 1992; Agarwal & Prasad, 1998; Parveen & Sulaiman, 2008). The finding, however, was consistent with the study by (Igbaria *et al*. (1995). Parveen & Sulaiman, (2008) who investigated the intention to use the Wireless internet using mobile devices by examining the complexity that influence usefulness and ease of use. The researchers reported that the complexity construct had a medium impact on both usefulness, ease of use and minimised the variance of their proposed model. This study, therefore, suggests eliminating the complexity construct from the VLEAM model due to its insignificant impact and violating the variance explanation.

9.2.3 LEARNING STYLES.

The results indicated that different learning styles had insignificant impacts on perceived usefulness and perceived ease of use of VLE ($p>0.05$ [0.981], $R^2 = 0.001$; $p>0.05$ [0.565], $R^2 = 0.007$, respectively). The small value of R^2 indicated that around 1% of the variance of perceived usefulness and perceived ease of use is explained by all four learning styles. The finding shows no significant differences in the scores of perceived usefulness and ease of use amongst all four learning style groups. Therefore, learning styles had very little or no impact upon both beliefs constructs. Although, it appears that divergers and convergers have higher scores than assimilators and accommodators. In principle, the results may be insignificant because the small sample size or response errors.

The study suggests that the previous experience with the various computer software or internet applications in daily life, workplaces or technology use in library may minimise the effect of learning style on perceived usefulness and perceived ease of use. The students may adapt themselves because of compliance to university policy and instructors requirements. Therefore, the students adapt their learning styles to new situations and do not keep their learning styles fixed. This is in accordance with theory of social constructivism. The theory of social constructivism highlighted that a learner may adapt his/her learning style according to the situation or social norms. Even Kolb

(2005) implied that when students carry out new tasks using new technology, they adapt their learning styles to their circumstances and acquire the efficacy to use new technology. This ability of students to adapt to new learning may result in having no impact on their learning styles on perceived usefulness and perceived ease of use.

Another plausible explanation for finding no relationship of learning styles with perceived usefulness and perceived ease of use is that the scores of all learning styles (Divergers, 5.21; Assimilator, 5.19; Convergers, 5.21; Accommodators, 5.19) were same; therefore, they may have a similar impact on student belief constructs.

In the absence of or having little prior research pertaining to VLE usage and its relationship to learning styles preferences, it is not possible to compare these findings with existing research. This research's findings, however, of these insignificant impacts of learning styles on the intention to use VLE are inconsistent with the findings from the very few prior studies that employed learning styles in relation to the adoption of a similar technology (Brown et al., 2006; Zuckweiler & Cao, 2009).

It is noteworthy to state that the learning styles found by previous empirical studies has a significant impact on the various e-learning approaches as described in the literature chapters of this research. These studies, however, were not conducted in terms of the adoption or acceptance of technology. Most of these previous studies employed and recommended Kolb LSI inventory (Lu et al., 2007; Bechter & Esichaikul, 2008; Naser-Nick, 2009). Some of these studies inquired into the effects of learning styles on total reading time, total discussion time, discussion boards, communication tools, course content and problem solving approaches. Other ones examined the impact of learning styles on interactions between instructors and students in order to modify the communication process. In addition, some of these studies focused upon the complexity that students face when discussing subjects between themselves both locally and internationally and issues related to understand each other. On the other hand, other studies attempted to develop and design modules that suit student needs. Accordingly, most studies revealed the significant importance of learning styles in the effective use of online learning.

The researcher noticed that previous studies showed that learning styles had a significant impact on various aspects of online learning, such as, functionalities or tools provided by the technology without considering its adoption or acceptance. This study provides empirical evidence that the four learning styles preference (divergers, convergers, assimilators and accommodators) had no influence on the intention of using VLE through belief constructs, which is adoption or acceptance in nature. Therefore, in the light of these contrary findings, it may be suggested through this study that learning styles may have the ability to affect the tasks, facilities, applications and tools available in VLE or other online learning approaches that are designed to complement the face-to-face learning. These components or functions provided by VLE systems represent a platform that works simultaneously and concurrently with tradition methods to assist and enhance the education process (Basioudis & DeLange, 2009). The commercial for VLE highlighted various tools and their functionality (tasks), such as, course content, communication and collaboration, self-evaluation and assessment, resources support (reading material), notice board and uploading of contents etc… these components may be affected by learning styles as been shown by other empirical studies. This means that there exists the possibility of relationships between learning styles and the components of VLE and/or online learning, although there is some inconsistency of the findings among various studies. Nevertheless, there are no affects of learning styles on variables involved in the process of acceptance or adoption of technology.

One possible explanation lies in the research variables involved in this study, in that TAM variables did not seem to measure the LSI. Miller (2005) supports this view by providing similar findings in a study that found the variables could not be measured by Kolb's learning styles. As the current study has revealed the perception of VLE use typically depends on the capabilities of students and their intention to use because of their level of confidence, which relates to their past experience and self-efficacy regardless of their preferred learning styles. Other support for is given when the study found that learning styles had significant impacts on independent variables (external variables) involved in the research model and not with acceptance variables (TAM core constructs) directly.

In the light of above discussion, the study may suggest that there are possible links between learning styles and functionality of the VLE system but not with adoption of VLE directly. This will be discussed in more detail in the next chapter in the implication section.

In order to explore further the impact /moderation of learning styles on perceived usefulness, the researcher separated the data of students belonging to each learning style and then determined correlation and regression coefficients between various external variables and perceived usefulness. Surprisingly, these new coefficient of relationships were different for each learning style, thus indicating that each learning style influences/moderates the relationships between seven external variables and perceived usefulness. Generally, the pattern showed that correlation coefficients were significantly higher in the case of people with the assimilator style of learning as compared to the divergent style, with the only exceptions being ease of use and self-efficacy. It means that assimilators are the best target learners for the current VLE model. For other learning styles, VLE may need to be adapted in terms of functionality etc... Interestingly, the regression coefficient implies that female assimilators had a more negative impact on perceived usefulness; that is, females feel VLE to be less useful. Overall, for assimilators, perceived ease of use, self-efficacy and specialisation have the highest impact on perceived usefulness. In the case of divergent learners and accommodators, experience had more impact on usefulness, i.e. the more experience they have the more likely they will perceive it as being more useful. In addition, only for convergers and accommodators, self-efficacy and specialisation do not influence perceived usefulness. In divergent learners, subjective norms have a negative impact on perceived usefulness; that is, more norms that are subjective may decrease their perceived usefulness, therefore, diverse learners perceive the usefulness of VLE differently.

Overall, it appears that learning styles influenced/moderated the relationships between seven external independent variables and perceived usefulness as the dependant variable in the New TAM model. Accordingly, the null hypothesis that the relationship between various independent variables and perceived usefulness under the VLEAM model is moderated by different learning styles was rejected. Thus, the learning style could play a significant role indirectly by acting as moderating factor in the New Extended TAM.

This new result demonstrated that learning styles affect the acceptance of technology through external variables indirectly. These seven variables are independent from the basic TAM variables and only assist the acceptance process. In this regard, learning styles can play a very important role as a moderator between the external variables and the beliefs constructs, namely, perceived usefulness and perceived ease of use, which in turn influence the intention to use VLE. The new result may contribute to the extension of existing TAM variables and help future researchers to extend knowledge in IS field and its acceptance.

Having discussed the outcomes of the data analysis with the impact of all the variables involved in the research model and its relationships, Table (9.1) summarises the findings of the research hypothesises, which was formulated in chapter five. These findings assist the study to depict the VLE acceptance model in the context of Libya.

Table 9-1Summary of research hypothesises

Hypothesis	Relationships correlation	Predictive on the model
H1. Perceived Ease of Use (PEOU) of the VLE is positively related to Perceived Usefulness (PU) of the VLE amongst Libyan university students.	Supported	Supported
H2. Perceived Ease of Use (PEOU) of the VLE is positively related to Attitude towards use (A) of the VLE.	Supported	Supported
H3. Perceived Usefulness (PU) of the VLE is positively related to Attitude towards use (A) of the VLE.	Supported	Supported
H4. Perceived Usefulness (PU) of the VLE is positively related to Behavioural Intention (BI) to use the VLE.	Supported *(when PE is removed)	supported
H5. Attitude towards use (A) of the VLE is positively related to Behavioural Intention (BI) to use the VLE.	Supported	Supported
H6. There will be no significant difference in scores of perceived usefulness of VLE between male and females. H7. There will be no significant relationship between gender and perceived usefulness of VLE.	Not supported	Not supported
H8. There will be no significant difference in scores of Perceived Ease of Use (PEOU) VLE between male and females H9. There will be no significant relationship between gender and Perceived Ease of Use (PEOU) of VLE.	Not supported	Not supported
H10. Subjective norms are positively related to Perceived Usefulness (PU) of the VLE.	Supported *(weak)	Supported
H11. The specialisation (major) of a student is positively related to Perceived Usefulness (PU) of the VLE.	Supported	Supported
H12. The specialisation (major) of a student is	Supported	Supported

positively related to Perceived Ease of Use (PEOU) of the VLE.		
H13. Job relevance is positively related to Perceived Usefulness (PU) of the VLE.	Supported	supported
H14. Self-efficacy will be positively related to Perceived Ease of Use (PEOU) of the VLE. H15. Self-efficacy will be positively related to Perceived Usefulness (PU) of the VLE.	Supported *(strong)	Supported
H16. Experience of the VLE is positively related to Perceived Usefulness (PU) of the VLE.	Supported	Supported
H17. Complexity is positively related to Perceived Usefulness (PU) of the VLE.	Partly supported *(weak)	Not supported
H18a. The average perceived usefulness score is the same for all four learning style groups.	Not supported	Not supported
H18b. the relationship between various independent variables and PU under TAM model is moderated by different learning styles.	Supported	Supported
H19. The average perceived ease of use score is the same for all four learning style groups.	Not supported	Not supported
H20. The percentage of study participants in each learning style group is the same for males and females.	Supported	Supported
H21. The percentage of study participants in each learning style group is the same for students of different specialisation groups.	supported	supported

9.3 VLEAM MODEL FIT

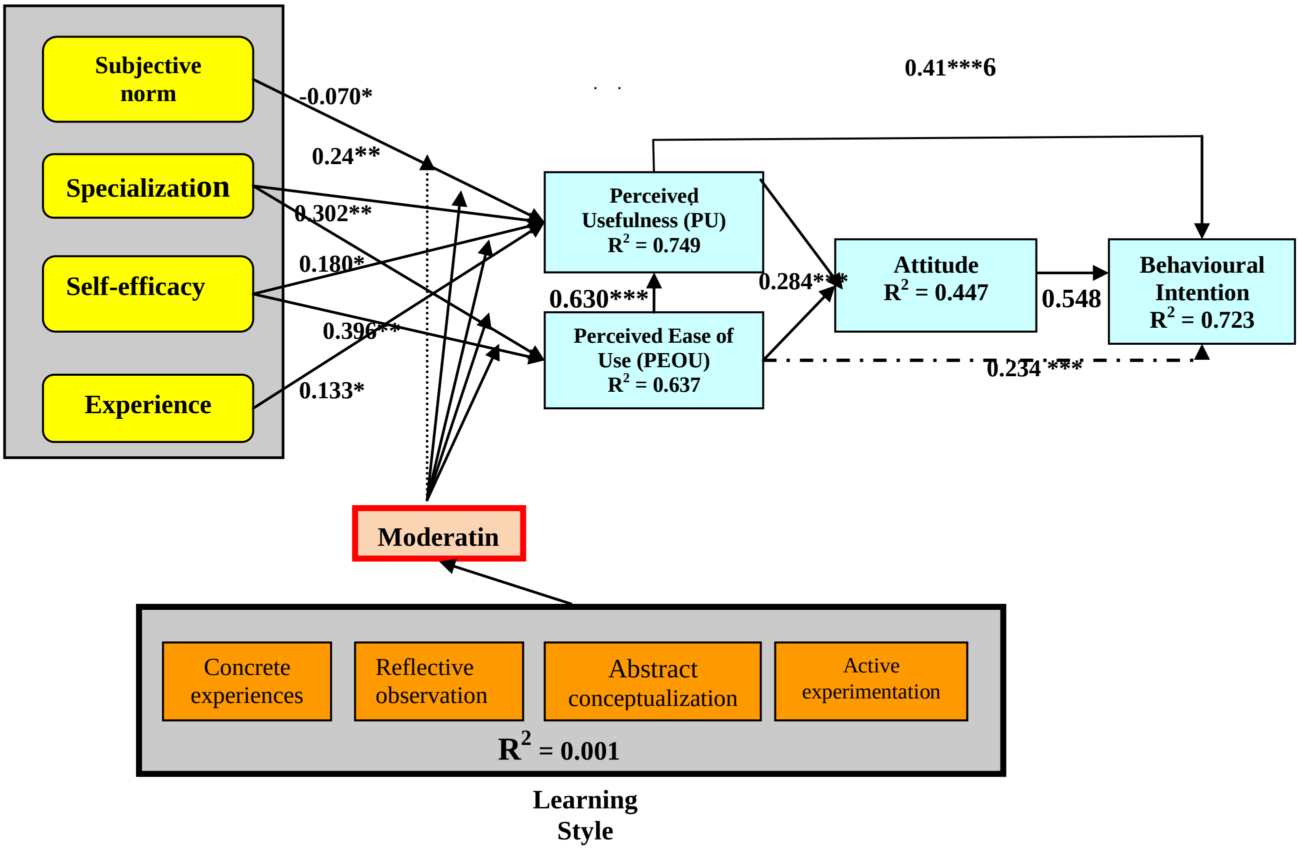
This study proposed the VLEAM in chapter five. The research at this stage is able to validate the integrated model of students' acceptance of VLE including the impact of leaning styles in a new environment of technology acceptance. VLEAM was developed by using grounded TAM as a tool and incorporated a learning styles model along with external independent variables that were believed to have a direct influence on belief constructs, which in turn directly influenced the intention to use VLE. Notably, as has been mentioned early the validated model, assist practitioners and researchers in the field of information systems were employed to validate constructs that may provide enough information for utilising technology acceptance.

Essentially, by considering the behavioural intention to use the VLE system, the VLAEM model explains about 72% of the variance from the perspective of university students. As a result, the study revealed the explanatory and predictive power of the model with regard to explaining acceptance of VLE in a different cultural setting. This is consistent with prior research (Venkatesh et al., 2003; Al-Gahtani, 2008; Chuang *et al*., 2009). Irrespective of learning style influences on the model this research indicates that students are keen to use VLE to develop their capabilities, confidence, necessary experience and skills gained without the effects of preferred learning styles. The predictive power of both belief constructs perceived usefulness (74%) of the variance is explained by external variables, perceived ease of use (63%) of the variance and attitude towards use (44%) of the variance. The findings also indicate that the impact of ease of use of the system may encourage students to utilise it when they acquire some experience. Venkatesh (2000) postulated that some of the determinants change over time with increasing experience and direct interactions with the system. The study suggests that experience is predictive of self-efficacy for using technology, thus the person's individual confidence in his/her ability to complete certain task will provide a positive attitude towards technology use (Al-Mogbel, 2002). Notably, previous experiences with skills obtained from different applications and software have been utilised (e.g., Internet use, social websites, online chat software and course work) have helped students develop skills to use VLE.

The study suggests that perceived usefulness is a determinant of intention to use both direct and indirect through attitude towards use, delineating the determinants of the construct of perceived usefulness to include perceived ease of use, self-efficacy, experience, specialisation and subjective norms as ranked based on its strong relationship. In the meantime, perceived ease of use is a strong determinant of intention to use VLE and the study can suggest a new path in the research model directly to intention, delineating the determinants of the construct perceived ease of use include: self-efficacy, specialisation and subjective norms. The predictive power of attitude is usefulness and ease of use constructs. In turn, attitude is the determinant of behavioural intention to use.

In order to explore the fit model in this study, the path of learning styles will be excluded from the model because of its insignificant relationship and its very weak influence on the belief constructs. The findings of this study reveal that the acceptance and use of the VLE system are compatible with different learning styles. They, therefore, may be utilised by students with a variety of learning styles. This implies that whether students are diverging, assimilating, converging or accommodating they have a strong positive perception towards using the VLE system but noting different specialisations. Contrary to that the study revealed that leaning styles have a significant impact as a moderator variable in that they can play a vital role in moderating the influence between the external variables and belief constructs of TAM. Subsequently, the study retains the paths of the moderation effect of learning styles in the research model. Based on the results, the VLEAM was re-constructed and shaped after excluding the weak relationships of the insignificant constructs. Figure (9.1) depicts the VLEAM acceptance model in this study. This new model may provide the researchers and designers with perceptive information about VLE acceptance.

Figure 9-1VLEAM model excluding insignificant path



9.4 CONCLUSION

The aim of this chapter was to discuss the findings of the data that had been analysed in the previous chapter. The study considered the analysis of multiple regression results as the main examination of the simultaneous effect of the variables on the research model. This chapter presented the key determinants that influence students' intention to accept using VLE based on their preference learning styles. The study examined the effect of the independent variables on the dependent variables (endogenous) to stimulate further discussion in order to examine the predictive ability of the variables and the explanatory power of the VLEAM model. The study confirmed that in terms of dependent variables the main determinants of intention to use are attitude towards use through the power of the influence of the belief constructs usefulness and ease of use. Furthermore, the main independent variables that influence the intention to use VLE is self-efficacy via perceived usefulness and ease of use based on the high value that it holds. Experience, subjective norms, specialisation also have significant impacts on the intention to use. For instance, the experience construct was found to be an important factor that influences students to perceive that the VLE is useful. It is recommended to consider this variable further. The study suggests that experience may influence self-efficacy and this relationship begs further examination in future research. It was found that family and friends or persons important to the student remain an important factor in cultures, such as, Libya. Subjective norms, therefore, influence usefulness but not ease of use. The study confirmed that those with a computer background perceive the VLE useful compared to other specialisations.

The study has found that gender, complexity and job relevance are not determinants of intention to use VLE and there are no significant differences between males and females in relation to their attitude to use the technology.

The main investigation in this study was to examine how learning style preferences impact on the process of accepting the technology. The study confirms that various learning styles have no affect on the research model, in that students can develop their capabilities and enhance their confidence to accept using VLE irrespective of their preferred learning style. The study, however, found that learning styles can play an important role as a moderator. This new result provides the researcher in this field insightful information for future research. Finally, the chapter delineated the paths of the variables that have an influence on the research model. This could assist in determining the decisions to adopt and accept the VLE system from the students' perspective. The chapter presented the final form of the model that can fit in this context.

With the abovementioned discussion, the study can respond to the research questions presented in chapter one. Therefore, the next chapter provides the answers to the research questions, followed by the research contribution along with its implications and limitations and recommendations for future research.

10 CONCLUSION

10.1 INTRODUCTION

This chapter summarises and concludes the findings of the study. The chapter summarises the results of the research questions. It also presents the theoretical, methodological and practical implications of the research. The chapter concludes by describing the research's contributions, its limitations and the future scope for research.

10.2 SUMMARY OF THE RESEARCH

This study determined the impact of learning styles and various external factors (gender, subjective norms, specialisation, self-efficacy, job relevance, experience and complexity) on the perception of students to use VLE. In the first stage the researcher explored the literature to understand the various associated factors that may influence students' perceptions and behaviour for using VLE. Based on a preliminary literature review the study divided the literature into three sections. The first section of the literature review identified the current context of VLE with respect to VLE in higher education, its benefits, VLE concepts, VLE users, VLE prior research of usage and the studies conducted that related to perceptions of use. Since the study was conducted in a Libyan university, the section reviewed and discussed the Libyan education context and use of technology. In the second section, the factors driving acceptance of VLE were explored. After comparing various theories and information system acceptance models the TAM theoretical model was selected as a basis from which to start. The researcher, however, thought that TAM has limited usages for VLE acceptance; hence, the third section of the literature explored a new dimension that is, learning styles and its impact on the acceptance of VLE. Different learning styles and theories behind these styles were explored and finally Kolb LSI model was selected. This experiential learning theory of Kolb was combined with TAM and the conceptual VLEAM research model for VLE acceptance. This research examined the VLEAM research model based on twenty-one hypothesises. The main research question was to conduct “an investigation into the influence of learning styles and other factors affecting students’ perception of VLE” from this point, the main research question was divided into four. In order to answer these four research questions the study tested the formulated hypothesises. The study detailed the research methodology in two phases. The first phase outlined the appropriate research methodology by reviewing the relevant research strategies and approach. The second face, designed the research for current study by developing relevant research instruments, selecting the research sample and measuring different constructs of the study. During the analysis and discussions process, the study responded to the research questions. The next section then answers the formulated research questions.

10.3 ANSWERING THE RESEARCH QUESTIONS

This section discusses the answers to the four research questions raised in this study. The answers to each are concluded under:

1) What are the perceptions of the students, their attitude towards and behavioural intention to use the VLE (Blackboard’s Course Management System (BCMS) based on their learning style?

The results show that the most of students have high mean scores for perceived usefulness and perceived easiness of using VLE. The comparison based on gender implied that there is no difference between males and females with respect of usefulness and ease of use of VLE, however, females found VLE significantly less easy to use. The

Libyan culture and gender differences may have directed this result. Attitude and behavioural intention to use are also highly positive, which indicates a positive attitude and behavioural intention to use VLE in Libya. The other section of the study determined the relationship between external variables, learning style, perceived usefulness, perceived ease of use, attitude and behavioural intention to use VLE. As expected the attitude to use VLE strongly influenced the behaviour intention to use VLE. The perception of usefulness or ease of use was driven because of the students' experiences and their capabilities and social norms. Other assumed external antecedents, such as, gender, job relevance and complexity does not influence their perceptions, attitudes and intention to use VLE. Preferred learning style did not directly influence students' perceived usefulness or ease of use. This analysis indicated that learning styles might have no influence nor contribute to the development of the model of VLE acceptance. The question, however, still remains whether students with different learning styles, such as, divergent, assimilator, convergent or accommodator have a different perception and influence or moderation on the relationship of the VLEAM model. This led to further exploration regarding how learning styles could influence the overall perception of VLE and is summarised by questions two, three and four.

2) What is the role of specialisation and learning styles on acceptance of VLE among Libyan university students?

The results show that the specialisation or background of the students plays a significant role. The perceptions of students with a computing and engineering background were different from those of social science students. It was found that students with a natural science or professional specialisation perceive VLE more useful compared to social science graduates (as detailed in chapter nine, section 9.2.2 "specialisation"). The results also found for each specialisation or background that they were equal percentage of students from each learning style, hence it may be inferred that background or specialisation does not influence the choice of a learning style by a student and vice versa. When the sample, however, was divided into four groups for each learning style and regression was carried out the results were very interesting. The study found that correlation and regression coefficient of specialisation with perceived usefulness was different for students having a particular learning style. In other words, influence of specialisation on usefulness was different depending on the preferred learning style of students. This implied that learning styles might not directly affect perceived usefulness but affects usefulness by moderating the relationship of usefulness with specialisation. The students from natural science backgrounds with any learning style perceive VLE as useful. In particular, from this faculty assimilators have the highest perceived usefulness, followed by converger, diverger and accommodators styles. On the other hand, students from other faculties (professional and applied science) do not significantly differ on perceived usefulness based on their learning style (details on chapter nine).

3).Are there any significant relationships between gender and learning styles?

The result found that males and females each have an equal number of students that exhibit the four different learning styles. For each learning style, there are equal number of females and males so the choice of learning style may not be influenced by the gender of the students.

This study shows that gender does not influence learning style and so may not influence the acceptance of VLE in Libya, although men in Libyan culture are generally seen as independent and women as dependent. Men usually do everything to meet family needs by going out because of cultural and religious factors.

Further research is required to explore how learning styles are developed. For example, a teacher style assessment procedure, teaching pedagogies (learner centric versus teacher centric) and culture etc… may influence an individual's style. This means that each individual may have different style. In most of western countries, education is moving towards a learner centric independent learning approach. That means each student is free to develop his/her on learning style. In power dominated cultures were the teaching is teacher centric (Libya and many eastern countries) the learner is almost forced to follow the style of the system or teacher; hence the males and females in the same class may have similar learning styles. As education evolves towards independent learning, student centric and technology-enabled then e learning may demand flexibility of the system to adapt for each learning style.

4) What is the impact of the learning styles on the factors that related to the TAM?

The regression results show that directly different learning styles do not influence perception of usefulness or ease of use. The results, however, found that learning style moderated the relationship between perceived usefulness and external independent variables (gender, subjective norms, specialisation, self-efficacy, job relevance, experience and complexity). The coefficient of correlation or regression that signifies the relationships were not same for students of different learning styles. Generally, in case of assimilators (a learning style) the impact of each independent external variable involved in (VLEAM) was highest for perceived usefulness. The order of impact decreased with the learning style, assimilator followed by divergent, accommodator and convergent finally styles. This means that assimilators are the best target learners for current VLE. To get maximum benefit from the VLEAM model, the parameters/functionality in the model should be altered to accommodate students of each learning style.

10.4 RESEARCH IMPLICATIONS

This section summarises three implications, theoretical, methodological and practical. Theoretical implications include the development of the model and how the relevant factors are able to explain perceptions towards use as well as the possibility of re-construct these factors based on a discussion the findings and provide suggestion. In addition, this section discusses the issues related to theoretical TAM and its shortening to provide a wide measurement in order to increase the effectiveness of the model. Methodological implication discusses the possibility of employing a mixed method in order to explain the variations in the results. The implication for practitioners will provide the benefits of VLEAM to managers and practitioners.

10.4.1 THEORETICAL IMPLICATION

This study integrates and validates VLEAM model by combining TAM with Kolb's learning styles. The study incorporates other important factors like social norms, specialisation, control etc… for an extension of the theoretical framework of basic TAM. The interesting theoretical implication of the model is the extension of basic TAM along with different learning styles. The results prove that learning style does not directly affect perceived usefulness or intention to use VLE. Learning styles rather moderate the relationship between external variables and student perceptions.

The model does not explain the 100% variance in students' perceptions and attitudes. This means that currently considered external factors as well as learning styles do not explain the full picture. Some latent variables that may further widen the TAM model may exist. The model also implied that the same theoretical construct could be exported to different cultures and countries without modifying the TAM model. This research makes a different contribution because it explored the impact of learning styles on acceptance of VLE, whereas, previous research explored impact of learning styles on other aspects. In line with TAM, this study confirmed that students' attitudes are a strong predictor of student intention of use VLE. Attitude is significantly affected by perceived usefulness and perceived ease of use. Perceived ease of use, however, has more influence on intention to use compared to perceived usefulness. Nevertheless, it is important noting that the study considered the ease of use of VLE in general without studying and measuring the functionality of the system. Therefore, if the functionality of the system was considered, the study may expect different results and the ease of use influence to intention may change in this case. Further research has to be conducted by incorporating the functionality of the system in order to measure in depth to what extent students perceive the facilities provided by VLE either easy or complex.

The findings of the study showed the appropriateness of the adapted theory. It appears that there is no problem with TAM as an accepted theory, which is empirically validated but the issue with TAM is that it is not able to cover fully the understanding of acceptance, especially when the system is much broader and more complex in nature. This is so because this kind of technology, involves not only facilitating technology but also multimedia learning content, access, interaction, collaboration, tracking, monitoring and assessment. Moreover, online learning systems, such as, VLE are designed based on the Internet platform. This means that the usage context is diverse from other simple application software. Owing to the capacity and wide functionality of a VLE, its investigation in relation to acceptance and the ways to measuring its effectiveness use need more consideration by going further beyond the belief constructs of TAM as a fundamental determinant of acceptance in order to understand fully the acceptance of IS.

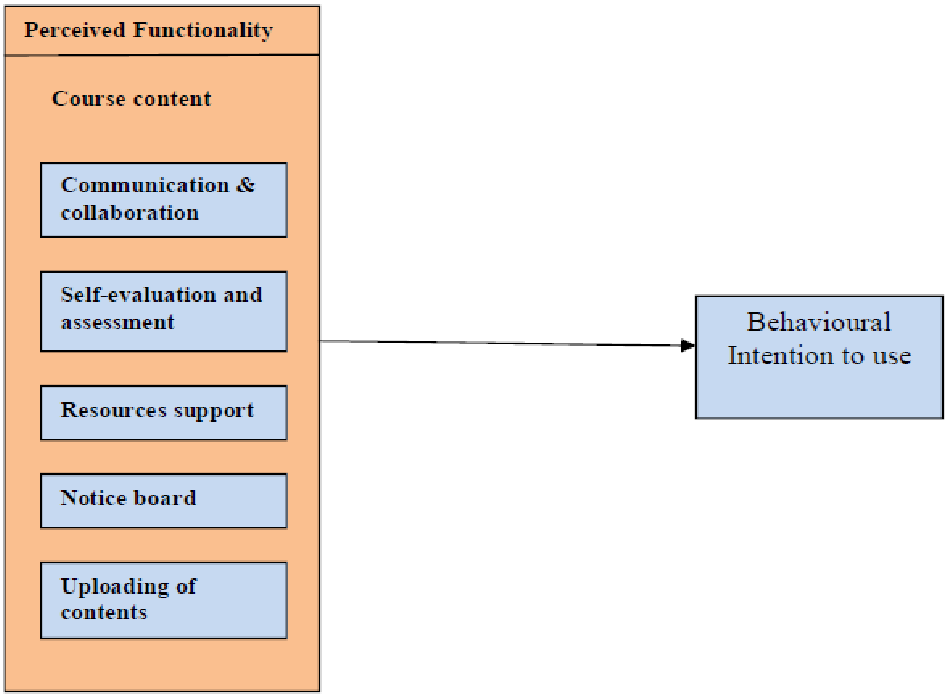
The absence of task focus measurement in user perceptions is perhaps the main reason for suspicions regarding TAM's validity. Further, this may possibly the reason for the lack of understanding that still exists irrespective of recent progress in usefulness and ease of use studies (Chuang *et al.*, 2009). The utilising of TAM with its limited belief construct items will perhaps not be able to handle and cover the technology characteristics that may provide a better understanding the phenomena.

This is one reason why TAM's beliefs constructs have limitations and provide only the minimum of measurement. The IS research community need to remedy the situation or risk a movement away from this framework. The currently used antecedents under TAM do not fully explain or measure students' perceptions and attitudes towards of VLE. Therefore, there is a need to correct the TAM framework or move away from it.

Prior TAM studies have only focused on users' perceptions of VLE and neglected perception about the functionality that is offered by VLE. Its functionality is very important as it identifies the elements of the system. VLE functionality includes course content, communication and collaboration, self-evaluation and assessment, resources support (reading material), notice board and uploading of contents etc…. The in-depth studies about users' perceptions of these components /elements may help a researcher to discover the usefulness and ease of using the system in a better way.

In summary, it emerges that the simple basic TAM model is of limited use. It must integrate other variables, such as, learning styles and user characteristics. Further, the gap in the TAM can be filled by looking at users' perceptions about the functionalities of the system rather than just perceived usefulness or ease of use. Hence, the research recommends incorporating perceived functionality as an independent factor along with perceptions about users' belief constructs. This will improve the efficiency and validity of the new technological acceptance model. Figure (10.1) illustrates the perceived functionality and its contents as follows

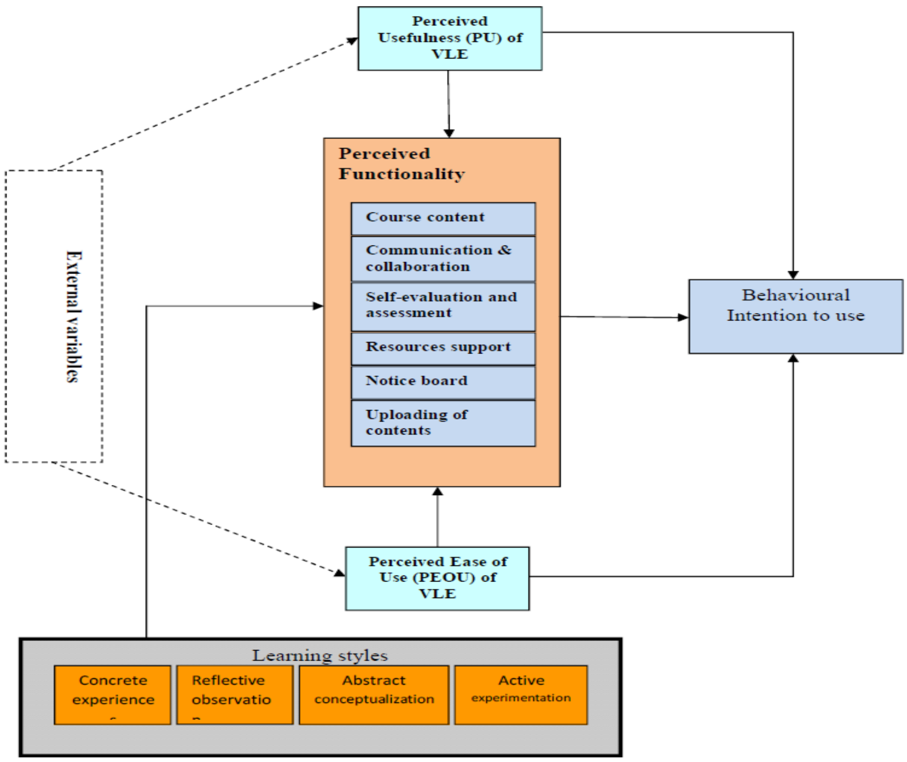
Figure 10-1Perceived Functionality in relation to Intention



The perceived functionality posited as independent variables may directly influence users' intentions. Each component works as sub-factor (entity) and may have items under each. The need is to design items to determine users' perceptions pertaining to each component of functionality. The interaction and involvement of the users to these components will reflect their perception of easiness and usefulness of VLE.

In addition, the study suggests that the role of learning styles needs to be explored further. For instance, it may posit that learning styles have some influence on student desire for function characteristics in the system. That is, students with different learning styles may prefer different kinds of functionality features in VLE. Hence, to capture the real perception of the users, the researcher suggests a model that links learning styles perceived functionality, perceived ease of use, usefulness, and behaviour intentions. Figure (10.2) proposes the extended future model.

Figure 10-2Learning styles path with perceived functionality (PF)



The findings of this study revealed that student perceptions and acceptance of VLE mostly dependent on their self-efficacy (ability and confidence) and past experience (familiarity). The model could explain a small percentage of variance in student perception and intention to use. Therefore, future studies involving TAM should also ask users about their perceptions on system interactivity and performance with respect of functionality. In other words, the belief constructs of TAM should also reflect task output performance.

10.4.2 METHODOLOGICAL IMPLICATION

The study employed a quantitative strategy to collect data, which was able to demonstrate the reliability of the findings and validate the research model. From the methodological perspective the study suggests that future research that investigates IS acceptance, which employs TAM as a base model or research model, should incorporate and adopt a qualitative method, such as, semi-structured interviews to complement and assist the usual quantitative method formulated mainly by TAM.

According to the analysis of the quantitative data discussed in chapter eight, a very weak relationship were found between learning styles and students' perceptions towards using VLE but surprisingly the relationship was found only when learning styles act as moderator with independent variables. In addition, the quantitative data has revealed other relationships between independent variables and its correlations with perception variables. These findings at least somewhat satisfied the investigations of this study. As explained earlier, TAM is mainly quantitative in nature and the study relied solely on the model's nature in the proposed model, which based on TAM. This led to provide only "what" reasoning in investigating the factors that may play role in understanding of VLE acceptance. Therefore, it may not provide "why" reasoning for the weak relationship described above, which the former may able to interpret in-depth beyond the closed questions of this survey. As a result, the simple form of the TAM instrument is not enough to provide a broader and wider understanding of the role of that factor for a better understanding of technology acceptance.

From a methodological perspective, the study suggests that future research should deploy the qualitative method to interpret further in-depth the missing facts. The incorporation of qualitative research may assist in overcoming the weakness of the TAM model in order to increase understanding and explain technology acceptance, especially when IS is broader and complex in nature. In addition, it will help designers and developers gain an in-depth understanding for the need to generate suitable features that increase the rate of user acceptance of the system (Baran, 2009). The power of mixed methods will provide a better explanation the underlying reasons, which affects users' acceptance of the IS.

The findings of this study imply that quantitative analysis can be useful if supported by qualitative data. Qualitative data provide richer, more comprehensive and perceptive reasoning derived from the perspective of participants. This mixed method, the researcher believes, will provide better comprehensive results and be complementary to TAM research, which is quantitative in nature (see future research section).

10.4.3 PRACTICE IMPLICATIONS

The adoption of VLE and its accomplishments in education are conditional upon students' enthusiasm to accept and use its features. Educators and decision makers should consider the importance of those factors that assist student perceptions to use it. The research model VLEAM incorporates a group of independent factors that support VLE acceptance. An understanding of the factors that are associated with student perceptions towards the use of VLE can direct strategies plans that decision makers can adopt in order to achieve effective use of VLE. The findings of this research identify some important information that makes suggestions for educators and developers to build a strategy to maximise the rate of acceptance of their students.

Studies have been carried out that address the problem of matching instruction to individual learning styles. Very few studies have investigated learning style preferences and their relationship to the acceptance of online learning. This research study contributed additional information to the body of literature on understanding the relationship between learning style preferences and VLE acceptance in the context of education. This research is among the very few studies conducted to investigate the learning style impacts and other factors that affect students' perceptions towards VLE use. Irrespective of the very weak statistical significance found in this study with respect to learning styles' influence on the perceptions of VLE use, and as described in chapter eight learning styles can moderate the relationships, its outcomes still suggest implications and recommendations for online learning designers, educators and managers of online institutions who invest huge sums of money on online education.

A lack of understanding exists how the online environment can be designed to be most effective and accepted. It remains problematic for educators and designers to be able to determine the relevant factors that relate to perceptions of use. This research adopted this problem through a focused investigation to attempt to understand the relationships between various learning styles and VLEs in general use without considering their characteristics and features.

Online learning designers should not only focus on developing and generating VLEs and facilitating instructional activities designed to match students' learning styles but also concentrate on developing features and components that give users choices when interacting with their contents in appropriate ways. The results of this study found that students with assimilators learning styles have the highest moderation between external variables and perception as compared to users with other learning styles. Hence, designers should take into account the different learning styles when they design functionality features for VLEs. The research also indicated that the educators should encourage and support student involvement with all facilities and functions of the system. University educators should focus upon students' learning style differences, especially when their style is less effective on the factors that positively relate to the perceptions of utilising VLE. Students may better adapt if their learning styles are considered thus. In addition, appropriate *guidelines* are needed, which allow students to practice the new learning environment.

These guidelines may increase the rate of acceptance. Thus, the study draws some implications in this regard. The significant impact of attitude on the intention to use indicates the magnitude of the students' feelings towards the use of technology. It is crucial for university managers to make an effort to engender positive feelings towards using VLE to compliment face-to-face education to ensure the successful student acceptance. Based on those positive feelings, university managers can work on the powerful antecedents that relate to attitude, for example, belief constructs, social factors (subjective norms), control factors (self-efficacy) and prior experience among students, which empirically been found to assist the acceptance of technology (VLE).

Accordingly, students can develop a positive attitude when they become aware of the benefits of VLE and its components to provide support for their education compared to traditional methods. University mangers and educators may launch awareness campaigns that concentrate on the educational benefits and advantages that students can derive by using the system. It is essential to support the benefits of using VLE over traditional education methods (Allen & Seaman, 2005, Katsifli, 2010).

Policy makers should also consider the impact of the social cultural environment and subjective norms on VLE functionality as has been found by (Sivo *et al*. 2007; MORI, 2008). Next sections describes the implication with respect to the main functionality of VLE that the researcher have suggests which reflects the outcomes of this research, this may imply for the present VLE in this university and may benefits to other VLE in general.

10.4.3.1 **Implication for the main functionality of VLE that influence students' use of VLE**

This research has revealed that the factors contributing to students' perceptions and utilisation of the VLE may be determined by what types of activities they undertake with the VLE. The implication from this is that when lecturers introduce and attend to use the VLE as part of supplement their face-to-face teaching course, they must ensure that the activities they set for students get the most effective use of the resource. In particular, as found in this research, the practical value of the activity should be prioritised over how the usefulness of the task rather than on their ease of use and the activity should be set up and undertaken. The students should be taking part in VLE activities that will enhance their study experience. If they can clearly perceive that the activities will be beneficial to them, students will be motivated to fully engage in them (functionality), regardless of how easy or difficult the task is. It is of key importance that the lecturer focuses their efforts on making the VLE activities appealing to students in this sense (useful). Findings and the relevant suggestions to develop more useful activities of VLE as the researcher interested only for main functionality i. e. "accessing course content", "communication and collaboration" and "self-evaluation and assessments" are discussed in detail in the following sections.

10.4.3.1.1 Course contents

The researcher found existing course content posted on the VLE in use to be muddled, confused, and disorganised in format and not likely to be of great benefit to students. Simplifying the layout and formatting of the course content of the VLE would help to enhance its value to students as it plays vital role in determining the usefulness of it.

The implication from this was that the standard of the design has a major impact on how much VLE is able to encourage students to use it. This recommended that attempt in making the course content visually accessible and attractive will make it easier and more useful for students to read and navigate around the content. Regardless of lecturers' experience of their subjects, few lecturers showed strong awareness of how best to utilise VLE and organise content for their students in new teaching concept. Lecturers often lack the know-how to design web-based content (Dillon et al., 2004) that provides optimal benefits for their students, thus, technical skill and expertise needed to develop the online-based content that are educational multimedia. It is important that lectures are given specialist training in order to support them to improve their abilities to develop course content that is suitable for e-pedagogic. From a micro perspective, instructional design (ID) tuition is a requirement, in order to impart design principles to the lecturers, as they are introduced to a new realm, moving from the classroom to VLE. This would make sure that lecturers give thought to presenting the material in an optimal online format, rather than just trying to display everything in exactly the same way as their hard copy notes.

Believing that e-pedagogical classes are an efficient "individual developer" method of ensuring that lecturers acquire required competencies, Brahler et al. (1999), noted that the approach of providing lecturers with training seminars is limited by their employers' inability to give them enough time off to prepare good web-based content for their students. Also, as students request more web-based content; this will increase the pressure on busy lecturers. For the purposes of this study, though, VLE is only being used to supplement classroom materials and online materials do not require a great deal of complexity. The knowledge and time required by lecturers to implement this is not a major concern in this scenario.

Even if lecturers are allowed time and learning support, they may still struggle with aspects of web developing (Govindasamy, 2002). From a macro perspective, consideration must be given to whether it may be more efficient to create an ID development team, consisting of lecturers, graphic designers, ID designers, software specialists and administrators who could collaborate with lecturers in producing their online content, potentially creating better content than the lecturers – mostly mere laymen in web developing terms – could achieve. Given the time and resources such a team would call for, it would be important that this setup be cost effective. An example of cost effectiveness might be content being developed for a big first year class, which is unlikely to vary much year-on-year, In contrast, content for a small group of postgraduate students which ceases to be relevant after a short period would not be cost effective for an ID team to work on. Brahler et al. (1999) suggested involving students in this work to reduce the associated labour costs. Students studying courses providing them with the necessary technical skills could make a big contribution to such a project, as long as the administrators document them well and try to hold onto the standout students after graduation, to maximise the institution’s gains from the ID content development.

Another approach would be to outsource the content development or buy it ready-made software companies. This can be costly and may not provide the specificity that lecturers might be after. Also, there would need to be continual spending on updates as software goes out of date. The institution would need to devote much time and effort to weighing the potential benefits and disadvantages of the possibilities in front of them to ensure they have good content acquired at a reasonable cost.

10.4.3.1.2 Communication and collaboration activity

The researcher in this study noticed that VLE to be underutilised, therefore some implications that may be solved through the following suggestions regarding communication and collaboration activity in order to increase the level of VLE acceptance and usage.

1- Provide students with relevant and interesting discussion subjects. As with their lectures, the teacher needs to prepare content that stimulates students and which improves their knowledge of both the syllabus and the general area of study.

2- Make sure that students are aware of the online resources such as discussion forum available to them for the course and keep them updated on a regular basis. This is particularly important for students who are new in using and just being introduced to VLE. The lecturer should encourage students the importance of contributing in the discussion forum and guide them in how they can benefit by using them throughout the lectures and tutorial at the starting of the course. By doing this will enable students get familiar with the functionality that were provided to them in order to participate in the discussion forum and to prevent them getting lost in VLE use.

3- Particular focus should be given to improving students' comfort and proficiency in communicating in English particularly in regards of written language and their capability to contribute more confidently in the discussion forum, as this was found by the study to be one of the main things that holds international students back from engaging in forum discussions with their colleagues as well as with instructors. As observed that skills in written language may play vital role in influencing students' usage of VLE especially the activity of communication and collaboration. One solution might be to provide English writing tuition during holidays, to help build students' confidence and assist the students to improve their written language skills and thus, be more confident to participate in the communication task. Including applications for spelling and grammar assistance in the forum would also encourage them (Dillon et al., 2007). The students participated in this study were native Arabic speakers and another solution might be to provide an application (attached to VLE) that allowed them to communicate in their home language.

4- A socio-cultural factor to this might be that students feel reluctant to engage in a discussion with their teacher or to question others' opinions, for fear of causing offence. The lecturer must work to bring down students' barriers and assure them that they can feel comfortable engaging in debate on the discussion forum. Picciano (1998) posits that the most important part of being a student is the interaction with colleagues and teachers. In particular, the provision for students to raise questions and chances for them to share opinions or to disagree with the points of view of the lecturer and colleagues is critical to students' learning. As available in the learning process in tradition learning (face-to-face) it should be available in VLE paradigm. They must be inquisitive, opinionated and willing to engage in debate. Collaboration and sharing information should be takes place, rather than competition, must be the mindset cultivated by the lecturer.

5- Provision of quick responses, perhaps promoted by setting deadlines or maximum time periods for answers to questions (Graham et al., 2000), would prevent students from feeling they have been ignored if they do not receive immediate feedback. Lecturers would be able to provide answers in a timely and organised fashion and provide continuity in the forum discussions, encouraging students to participate.

10.4.3.1.3 Self-evaluation and assessments

The VLE used self-assessment in the form of multiple choice tests as installed by the publisher, so the students could using this functionality for the purpose of their exam revision.

Govindasamy (2002) argued that multiple choice testing assists students in memorising course content without testing their understanding. This suggests that such a "summative" form of evaluation is inferior to more "formative" methods because learner can score in such assessments throughout guessing for the correct answer instead of understanding of the subject matter. According to this, the researcher could recommend the formative assessment and this led us to looked at learning styles of the students in using VLE.

Formative evaluation takes place during the course, to test the understanding of the students, providing valuable feedback for the lecturer regarding the effectiveness of his or her classes. Black & Wiliam (1998) argued, using an in depth literature review, that effective "formative" assessment has massive benefits for students and can improve students' learning. Therefore, rather than using summative assessments, alternative suggesting implement formative assessments in order to integrate the available VLE, so that students focus on understanding and not just memorising. Approaches for achieving this include:

- Designing online materials to promote learning through collaboration with fellow students
- Testing higher order thinking skills in order to develop more complex understanding
- Implementation of the constructivist approach to education (Carter et al., 2003).

10.5 RESEARCH CONTRIBUTION

This study conducted a literature review and validated a model for acceptance of a VLE system based on learning styles along with a basic TAM model. This extended model employed a learning style model along with other important factors including social and control ones in order to develop the extended model. The results of this new model were supported by empirical work and previous studies that related to it. After testing hypothesises, answering the research questions and validating the research model this study has contributed to knowledge. These contributions are described below.

1- The study has developed a Virtual Learning Environment Acceptance Model (VLEAM), which combined two theoretical based models. The model incorporated factors that provide a better understanding of student acceptance of VLE and its usefulness towards their education purpose in the Libyan context (University in Tripoli). This model specifically examined the impact of learning styles on the acceptance of VLE. The VLEAM is the extended body of knowledge of the TAM theory. It was implemented and it validated the model for Libyan University students. This model will provide valuable information for decision makers to not only to invest and adopt this technology in other institutions but also for the benefit of future researchers of this country. This study validated the model for applicability and robustness in a new cultural environment, that is, in Libya. This model has not previously been applied and validated in the Libyan context so the first contribution made by this study is the validation of this model in a different culture context.

2- This extended model considered leaning styles as additional moderating variables that influence the relationship between external factors and constructs related to beliefs on TAM. This new contribution may help researchers to consider the role of moderating variables when designing VLE technology and functions. The study found that learning styles do not have a direct effect on perceived usefulness or perceived ease of use; however, learning styles can affect perceptions because they moderate the relationship between external variables and users acuity. The model shows how students with different learning styles may expect different feature from VLEs because learning styles influence the system's utility through moderation. For instance, students with assimilator styles could have positive moderation and influence on the relationships between external factors (gender, subjective norms, specialisation, self-efficacy, job relevance, experience and complexity) and perceived utility.

3- This study was different by incorporating comprehensive factors that included social factors, control factors and learning style factors in order to develop a new VLE acceptance model in a new context. In most cases of prior research, not all these factors have been considered within a single study rather just a few have been included by each. Hence, this model's integration of different factors resulted in a comprehensive multi-dimensional model. The study revealed that future research should move away from basic TAM and adopt a comprehensive integrated model in order to understand VLE acceptance.

4- The study showed that only one factor, specialisation, does not fully explain perceived usefulness or perceived ease of use. Students with a computer background may have perceived utility higher; however, the learning style of the students along with specialisation may result in positive or negative perceptions and attitudes.

5- The findings of this study contribute to the adoption and acceptance field, for example, the outcomes show that the ease of use is an important determinant of intention to use VLE directly. As students perceived the VLE easy rather than useful, the study suggests to re-path the ease of use directly influenced the intention to use as a new result. As discussed earlier its implication is to warn the educator to balance ease of use and usefulness of VLE in a student's education.

6- The study contributed by validating the Arabic version of the instrument. This validation is reliable and the instrument can be used to conduct future research in the Arabic region into the technology acceptance of E-learning.

7- This study directs the researchers and VLE developers to incorporate learning style functionality and features into VLE and adapt the software accordingly.

10.6 LIMITATIONS OF THE RESEARCH

The field of Virtual Learning Environment acceptance is an emerging area. This research has contributed to the body of adoption knowledge in the perception of VLE use based on prior empirical and theoretical research. The study developed a model based on technology acceptance theories comprising of learning styles theories. This research is affluent by its content as it developed a conceptual model, which was validated by using a sample of Libyan students drawn from a comprehensive range of specialisms. The research succeeded to some extent in answering the research questions. The research, however, suffered a number of limitations, which have been encountered by other pieces of research in the same field.

1. The range of the study is limited to one university site; therefore, the findings could have limited generalisability.

2. The sample population consisted of undergraduate students only; this also limited the generalisation of the study among its various users, such as, teachers.
3. The study is restricted by time and used a cross-sectional design. Previous research has reported that learning styles can change and develop over time because students promote knowledge and experience during the learning period (Riding and Rayner, 1998). In terms of learning styles, changes over time and the experience of using technology, indicate that a longitudinal study may be useful.
4. The investigation of this study is based on the prediction of use via intention of use but excluding the actual use. This could be a limitation but the link between intention and actual use has been empirically supported by previous well-known studies (Davis et al., 1989; Venkatesh and Davis, 2000).
5. Participants have responded to the research instrument with their own feelings, bias effects may be present.
6. One of the main limitations encountered in this study is the multi-collinearity problem. Multi-collinearity occurs in regression where several predictors are highly correlated (co dependence). The absence of multi-collinearity is an essential pre-requisite for a good multiple regression model. Multi-collinearity may be caused by (i) too many redundant variables, (ii) the presence of latent variables, (iii) the presence of high-order interaction terms, (iv) the dependence of variables in a polynomial model, and (v) when a composite score is included in the model. The study found some results are affected by this, for example, what has been noticed in the outcome of job relevance as differences was mixed between simple and multiple regression analysis as discussed in chapter eight.

Where, in simple regression was P value P<0.05 and the variance was good, R^2 25%, while in the case of multiple regression it was insignificant. Owing to the fact that this may cause the results to be inaccurate to some extent, it may limit the research's conclusions. This revealed that the variance, standard error and parameter estimates are all inflated. In order to overcome this problem, there are various different approaches as will be discussed in the next section and suggested by Draper and Smith (2003).

7. The study employed only one method (quantitative) and is then limited to the predefined instrument derived from previous TAM studies. This may limit the findings that depend on the questions answered by the participants and based on this the findings provide only the reasons of "what", which limit the wide understanding of the "why" reasons as in-depth elicitations of the perceptions of the participants.
8. The study was a self-reported one; its validity is based on the participants' perceptions, understandings and truthful responses to the questions.
9. The study is limited to the Libyan context.

Despite the limitations encountered during this research, the study has succeeded to some extent to highlight some of the new findings in the field of adoption and acceptance of large systems, such as, e learning as described in chapter nine. The study at least in brief explained the deficiencies or flaws in the theory of TAM in terms of the extent of its inability to measure and elucidate fully the perceptions of students of wide systems, such as, VLE. In addition, it provided a better understanding and measure of the learning styles due to the nature of the basic constructs of the model. It is important to mention that the study also recommended the integration of a new construct, which may through it, could give a greater opportunity to understand the acceptance and the perceptions of users, especially for a system is interactive.

10.7 Future Research

According to the study's outcomes, its responses to the research questions and the validation of hypothesises, a number of supplementary areas were encountered, which require further research. The following are suggestions for the direction of future research.

1. In order to overcome the issue of understanding the real interaction of users by the functionality provided by the system, a future study needs to incorporate another construct, namely, perceived functionality described earlier in implication section. This construct contains all the components provided by the IS (e.g. VLE). Each component should contain items designed to represent the actual interactions or the tasks performed by the users. The items derived from usefulness and ease of use of TAM should be developed to suit the functionality of the system. In this regard, for example, the course contents component could be as follows, (as one example of usefulness) '*using VLE to access course content has helped me to accomplish my learning task more quickly*.' The item of ease of use could be '*learning to use VLE to access course content has been easy for me*.' This means develop new instruments where needed to cover any utility impeded by the system. In relation to learning styles impact, first a future study should integrate a learning styles instrument that suits the online learning. At the same time, a learning styles factor should influence perceived functionality directly, as presented in Figure (10.2) in the implication section.

2. Based on paragraph one in this section, to avoid analysing the learning styles relationships separately as in this study, it is possible to involve learning styles constructs in the multiple regression technique with other independent factors. By doing so, a hypothesis can be developed based on the regression equation and learning styles, computed as any normal independent variable with a normative score rather than by an ipsativity ranked procedure (Kolb and Kolb, 2005). The Ispative scale is a measurement that forces respondents to compare two or more favourable options and chose one that is preferred. This measure is often called the "forced choice" scale (Kolb and Kolb, 2005). Cornwell and Dunlap (1994) reported that ipsative scores could not be factored and that in a correlation-based analysis of ipsative values the data cannot interpret and cause invalid results.
3. The findings of this initial investigation encourage expansion in the use of VLE and continued examination of student perceptions by monitoring learner performance outcomes. Further research, therefore, is required to determine how most students experience the use and benefits of VLE within and outside the campus.
4. This study only investigated student experiences using the VLE installed by the university over a specific time. Further study is needed to investigate the perceptions of two different elements, which are essential to VLE learning in higher education. An opportunity is required to investigate VLE acceptance from both students and university staff to understand better all aspects of VLE in terms of online learning acceptance at the university. This may include other factors that may contribute to the process of acceptance, for example, *motivation, skills, faculty support* and notice should focus on the influence of

ability in written English when interactions with the system's communication and collaboration component affect students' perceptions of utilising the VLE.

5. As described in the methodological implication section, a mixed method is useful to replicate this study by using the integrated research model and in addition include the suggestion contained in Figure (10.2). A qualitative data should be employed to investigate the realm of acceptance technology to complement the usual quantitative research tools. This will enable researchers to gain detailed insights into the underlying reasons that pertain to users' perceptions.
6. The absence of multi-collinearity is necessary in order to apply the regression model and obtain proper results. The multiple regression model will fail if several predictors are highly correlated, the causes of which were discussed earlier in the previous section. In future research, to solve this problem the sample size needs to be increased, which will and improve the predictions of the variables. If one variable cannot contribute to explaining the variance, it would be discarded by applying stepwise regression. Other issues to consider would include applying the partial least square (PLS) procedure. This method would allow a flexible approach to constructing predictive models when the variables are too many and highly collinear. Another technique to bear in mind might be to orthogonalise the variables so as to make them mathematically independent.

10.7 CONCLUSION

According to researchers, advancement in educational systems will be based on the VLE System, which needs to pay special attention to the students' anxieties about the replacement of the conventional education and teaching system. Their major reason for concern was that the new learning model might entirely replace the traditional education system (face-to-face) where students and teachers effortlessly communicate with each other. This research adopted the perspective of utilising VLE as a new learning approach into the learning domain based on students' preferred learning styles, which can be applied in uni or multi-modal fashion.

In 21st century, it would be a challenge for various campuses of institutions of higher education (IHD) to design, implement and use the VLE System, especially IHD in Libya instead of thinking whether to use it or not (Levy, 2003). Therefore, the research focuses on how students can accept the VLE system in traditional institutions and university based campuses by emphasising the factors that influence students' acceptance of this new learning approach. According to the outcomes of this research and regardless of the influence of learning styles on students' perceptions, two imperative aspects require highlighting for the implementation of VLE in university based educational systems.

The first aspect is to analyse that how effectively the learning activity has been communicated between the instructor and the learner (Owston, 1997). It depends upon the way of instruction, that is, how systematically it has been organized and managed by the instructors to motivate the learner. According to Sorensen & Takle (2002), the process of e learning does not mean that it is better than the other methods rather the quality and systematically organized way of instructions and learning is much more important to promote the knowledge building process. It is, therefore, the duty of the instructor and institution to offer sufficient and adequate learning opportunities to the student in such environments where students can interact to the teacher without any difficulty (Moore, 1993). Therefore, the basic job of the instructor is to offer such a task where VLE can be employed.

Secondly, the purpose of introducing VLE as a tool is to develop and improve the capabilities of students so that learning skills may be built, rather than eliminating the role of lecturer as a main facilitator. Hence, it is essential that the protagonist of a lecturer in VLE is to change from a sole knowledge provider to that of facilitator, i.e. teacher-centred to student-centred practice. In the meantime, the learner is required to change from a passive listener to that of active collaborator (Agostinho *et al.,* 1997). Ruberg *et al.,* (1996) emphasised that adjustments are required from both ends (students and the lecturers) to make interactions successful in the VLE. Therefore, students need to be familiar with non-linear asynchronous learning rather than the typical face-to-face environment, which is linear focusing on a single discussion thread.

Consequently, the current study demonstrates that students are still living with their experiences, competencies, strengths and potentials. Students, however, should be more emphasised on the usefulness of VLE as compared to its ease of use stage. The study shows that the students are still at the beginning of the phase of acceptance. As noticed by the researcher the instructional means of the course delivery deployed are still information-based with a minimum level use of active collaborative learning. The adoption and practice of a VLE in supporting a classroom-based teaching and learning environment should play more than just an old-style information delivery role. Therefore, in addition to developing the usefulness and utilities of VLE, it also fosters higher interactivity and collaboration to facilitate knowledge building. The lecturer should focus on the integration of the tasks of VLE into the existing face-to-face curriculum to take advantage of the capability and flexibility that a VLE is able to offer to the student.

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12 APPENDIX A

12.1 APPENDIX (A)RELIABILITY

Reliability

Case Processing Summary

		N	%
Cases	Valid	302	100.0
	Excluded[a]	0	.0
	Total	302	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.952	.952	6

PU

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.964	.965	6

PE

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.905	.907	5

ATT

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.922	.924	5

BI

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.866	.867	2

SN

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.948	.950	2

JR

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.915	.917	6

SE

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.918	.922	3

CX

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.791	.782	12

Concrete experience (CE)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.823	.814	12

Abstract conceptualisation (AC)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.771	.766	12

Reflective observation (RO)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.814	.810	12

Active experimentation (AE)

12.2 APPENDIX (A) FACTOR ANALYSIS

Factor analysis for PEOU

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.914
Bartlett's Test of Sphericity	Approx. Chi-Square	2193.637
	df	15.000
	Sig.	.000

Communalities

	Initial	Extraction
PE1	1.000	.843
PE2	1.000	.839
PE3	1.000	.846
PE4	1.000	.880
PE5	1.000	.852
PE6	1.000	.842

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
PE1	.918
PE2	.916
PE3	.920
PE4	.938
PE5	.923
PE6	.918

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Factor analysis for PU

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.872
Bartlett's Test of Sphericity	Approx. Chi-Square	1972.978
	df	15.000
	Sig.	.000

Communalities

	Initial	Extraction
PU1	1.000	.776
PU2	1.000	.775
PU3	1.000	.851
PU4	1.000	.840
PU5	1.000	.848
PU6	1.000	.751

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
PU1	.881
PU2	.880
PU3	.923
PU4	.916
PU5	.921
PU6	.867

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Factor analysis for Attitude ATT

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.797
Bartlett's Test of Sphericity	Approx. Chi-Square	1154.693
	df	10.000
	Sig.	.000

Communalities

	Initial	Extraction
ATT1	1.000	.689
ATT2	1.000	.673
ATT3	1.000	.811
ATT4	1.000	.746
ATT5	1.000	.730

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
ATT1	.830
ATT2	.820
ATT3	.901
ATT4	.864
ATT5	.855

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Factor analysis for Behavioural Intention BI

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.843
Bartlett's Test of Sphericity	Approx. Chi-Square	1190.785
	df	10.000
	Sig.	.000

Communalities

	Initial	Extraction
BI1	1.000	.746
BI2	1.000	.812
BI3	1.000	.779
BI4	1.000	.820
BI5	1.000	.677

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
BI1	1.000	.746
BI2	1.000	.812
BI3	1.000	.779
BI4	1.000	.820
BI5	1.000	.677

Extraction Method: Principal Component Analysis.

Factor analysis for Subjective norms SN

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	263.559
	df	1.000
	Sig.	.000

Communalities

	Initial	Extraction
SN1	1.000	.882
SN2	1.000	.882

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	511.915
	df	1.000
	Sig.	.000

Communalities

	Initial	Extraction
JR1	1.000	.952
JR2	1.000	.952

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
JR1	.976
JR2	.976

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Component Matrix[a]

	Component
	1
SN1	.939
SN2	.939

Factor analysis for Self-efficacy SE

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.846
Bartlett's Test of Sphericity	Approx. Chi-Square	1485.724
	df	15.000
	Sig.	.000

Communalities

	Initial	Extraction
SE1	1.000	.721
SE2	1.000	.756
SE3	1.000	.805
SE4	1.000	.824
SE5	1.000	.657
SE6	1.000	.495

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
SE1	.849
SE2	.870
SE3	.897
SE4	.908
SE5	.811
SE6	.704

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Factor analysis for Complexity CX

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.698
Bartlett's Test of Sphericity	Approx. Chi-Square	740.109
	df	3.000
	Sig.	.000

Communalities

	Initial	Extraction
CX1	1.000	.843
CX2	1.000	.928
CX3	1.000	.825

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
CX1	.918
CX2	.963
CX3	.908

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

13 APPENDIX B

13.1 HYPOTHESES ANALYSIS (SIMPLE REGRESSION)

Descriptive Statistics

	Mean	Std. Deviation	N
A.PU	5.1959	.99351	302
A.PE	5.3554	1.03120	302

Table H1.1

Correlations

		A.PU	A.PE
Pearson Correlation	A.PU	1.000	.821
	A.PE	.821	1.000
Sig. (1-tailed)	A.PU	.	.000
	A.PE	.000	.
N	A.PU	302	302
	A.PE	302	302

Table H1.2 Pearson correlation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.821[a]	.674	.673	.56834

a. Predictors: (Constant), A.PE

Table (H1.3) model summary of Regression

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	200.200	1	200.200	619.796	.000[a]
	Residual	96.903	300	.323		
	Total	297.103	301			

a Predictors: (Constant), A.PE
b Dependent Variable: A.PU
Table (H1.4) PEOU ANOVA

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	.960	.173		5.544	.000			
	A.PE	.791	.032	.821	24.896	.000	.821	.821	2021

a Dependent Variable: A.PU
Table (H1.5) Coefficient correlations

Descriptive Statistics

	Mean	Std. Deviation	N
A.ATT	5.5166	.80509	302
A.PE	5.3554	1.03120	302

Table (H2.1) Mean values

Correlations

		A.ATT	A.PE
Pearson Correlation	A.ATT	1.000	.625
	A.PE	.625	1.000
Sig. (1-tailed)	A.ATT	.	.000
	A.PE	.000	.
N	A.ATT	302	302
	A.PE	302	302

Table (H2.2) Pearson correlation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.625[a]	.391	.389	.62924

a Predictors: (Constant), A.PE
b Dependent Variable: A.ATT
Table (H2.3) Model summary of Regression

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	76.315	1	76.315	192.742	.000^a
	Residual	118.782	300	.396		
	Total	195.097	301			

a. Predictors: (Constant), A.PE

b. Dependent Variable: A.ATT

Table (H2.4) A.ATT - ANOVA

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	2.902	.192		15.128	.000			
	A.PE	.488	.035	.625	13.883	.000	.625	.625	.625

a Dependent Variable: A.ATT

Table (H2.5) Coefficients correlations

Descriptive Statistics

	Mean	Std. Deviation	N
A.ATT	5.5166	.80509	302
A.PU	5.1959	.99351	302

Table (H3.1) Mean statistics

Correlations

		A.ATT	A.PU
Pearson Correlation	A.ATT	1.000	.649
	A.PU	.649	1.000
Sig. (1-tailed)	A.ATT	.	.000
	A.PU	.000	.
N	A.ATT	302	302
	A.PU	302	302

Table (H3.2) Pearson correlations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.649^a	.421	.419	.61356

a Predictors: (Constant), A.PU

b Dependent Variable: A.ATT

Table (H3.3) Model summary of Regression

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	82.160	1	82.160	218.246	.000^a
	Residual	112.937	300	.376		
	Total	195.097	301			

a Predictors: (Constant), A.PU

b Dependent Variable: A.ATT

Table (H3.4) ATT ANOVA

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	2.784	.188		14.786	.000			
	A.PU	.526	.036	.649	14.773	.000	.649	.649	.649

a Dependent Variable: A.ATT

Table (H3.5) Coefficients

Descriptive Statistics

	Mean	Std. Deviation	N
A.BI	5.8464	.75309	302
A.PU	5.1959	.99351	302

Table (H4.1) Mean statistics

Correlations

		A.BI	A.PU
Pearson Correlation	A.BI	1.000	.694
	A.PU	.694	1.000
Sig. (1-tailed)	A.BI	.	.000
	A.PU	.000	.
N	A.BI	302	302
	A.PU	302	302

Table (H4.2) Pearson correlations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.694^a	.481	.479	.54334

a. Predictors: (Constant), A.PU

Table (H4.3) Model Summary

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	82.146	1	82.146	278.259	.000[a]
	Residual	88.565	300	.295		
	Total	170.711	301			

a. Predictors: (Constant), A.PU

b. Dependent Variable: A.BI

Table (H4.4) BI - ANOVA

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	3.114	.167		18.677	.000			
	A.PU	.526	.032	.694	16.681	.000	.694	.694	.694

a Dependent Variable: A.BI

Table (H4.5) Coefficients

Descriptive Statistics

	Mean	Std. Deviation	N
A.BI	5.8464	.75309	302
A.ATT	5.5166	.80509	302

Table (H5.1) Mean statistics

Correlations

		A.BI	A.ATT
Pearson Correlation	A.BI	1.000	.811
	A.ATT	.811	1.000
Sig. (1-tailed)	A.BI	.	.000
	A.ATT	.000	.
N	A.BI	302	302
	A.ATT	302	302

Table (H5.2) Pearson correlations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.811[a]	.657	.656	.44154

a. Predictors: (Constant), A.ATT

a Predictors: (Constant), A.ATT

b Dependent Variable: A.BI

Table (H5.3) Model Summary of Regression

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	112.224	1	112.224	575.636	.000[a]
	Residual	58.487	300	.195		
	Total	170.711	301			

a. Predictors: (Constant), A.ATT

b. Dependent Variable: A.BI

Table (H5.4) BI - ANOVA

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	1.662	.176		9.433	.000			
	A.ATT	.758	.032	.811	23.992	.000	.811	.811	.811

a. Dependent Variable: A.BI

Table (H5.5) Coefficients

Descriptive Statistics

Dependent Variable:A.PU

gender	Mean	Std. Deviation	N
Male	5.2475	.89557	136
Female	5.1536	1.06790	166
Total	5.1959	.99351	302

Table (H6.1) Mean statistics

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
A.PU	Equal variances assumed	6.776	.010	.817	300	.415
	Equal variances not assumed			.831	299.828	.406

Table (H6.2) T-test of Gender and PU

Tests of Between-Subjects Effects

Dependent Variable:A.PU

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.660[a]	1	.660	.668	.415
Intercept	8087.306	1	8087.306	8184.342	.000
gender	.660	1	.660	.668	.415
Error	296.443	300	.988		
Total	8450.361	302			
Corrected Total	297.103	301			

a. R Squared = .002 (Adjusted R Squared = -.001)

Table (H6.3) Test of subjects of gender and PU

Coefficients[a]

Model	Unstandardized Coefficients		Std Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tol	VIF
1 (Constant)	5.248	.085		61.562	.000					
dummygender	-.094	.115	-.047	-.817	.415	-.047	-.047	-.047	1.000	1.000

a. Dependent Variable: A.PU

Table (H7.1) coefficients of gender and PU

Descriptive Statistics

Dependent Variable:A.PE

gender	Mean	Std. Deviation	N
Male	5.4853	1.01054	136
Female	5.2490	1.03877	166
Total	5.3554	1.03120	302

Table (H8.1) Mean statistics

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
A.PE Equal variances assumed	.459	.499	1.991	300	.047	.23630	.11868	-.13232	.32019
Equal variances not assumed			1.996	291.297	.047	.23630	.11836	-.12842	.31629

Table (8.2) T-test of Gender and PU

Tests of Between-Subjects Effects

Dependent Variable:A.PE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4.174[a]	1	4.174	3.964	.047
Intercept	8613.640	1	8613.640	8180.070	.000
gender	4.174	1	4.174	3.964	.047
Error	315.901	300	1.053		
Total	8981.556	302			
Corrected Total	320.075	301			

a. R Squared = .013 (Adjusted R Squared = .010)

Table (H8.3) Test of subjects

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	5.485	.088		62.338	.000					
dummygender	-.236	.119	-.114	-1.991	.047	-.114	-.114	-.047	1.000	1.000

a. Dependent Variable: A.PE ,
sig of r= .024

Table (H9.1) coefficients

Descriptive Statistics

	Mean	Std. Deviation	N
A.PU	5.1959	.99351	302
A.SN	6.2252	.69691	302

Table (10.1) Mean

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.396a	.157	.154	.91367

a. Predictors: (Constant), A.SN

Table (10.2) Model summery

ANOVAb

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	46.665	1	46.665	55.899	.000a
	Residual	250.438	300	.835		
	Total	297.103	301			

a. Predictors: (Constant), A.SN

b. Dependent Variable: A.PU

Table (10.3) ANOVA

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1.679	.473		3.547	.000	.747	2.610			
	A.SN	.565	.076	.396	7.477	.000	.416	.714	.396	1.000	1.000

a. Dependent Variable: A.PU , r sig=.000

Table (10.4) **Coefficients**

Descriptive Statistics

	Mean	Std. Deviation	N
A.PU	5.1959	.99351	302
DUMMYPROFSSIOAL&APPLIED	.3510	.47807	302
DUMMYNATURAL	.3477	.47702	302
DUMMY_SOCIALSC	.3013	.45959	302

Table H11.1

Correlations

		A.PU	DUMMYPROFSSIOAL&APPLIED	DUMMYNATURAL	DUMMY_SOCIALSC
Pearson Correlation	A.PU	1.000	.168	.434	-.626
	DUMMYPROFSSIOAL&APPLIED	.168	1.000	-.537	-.483
	DUMMYNATURAL	.434	-.537	1.000	-.479
	DUMMY_SOCIALSC	-.626	-.483	-.479	1.000
Sig. (1-tailed)	A.PU	.	.002	.000	.000
	DUMMYPROFSSIOAL&APPLIED	.002	.	.000	.000
	DUMMYNATURAL	.000	.000	.	.000
	DUMMY_SOCIALSC	.000	.000	.000	.
N	A.PU	302	302	302	302
	DUMMYPROFSSIOAL&APPLIED	302	302	302	302
	DUMMYNATURAL	302	302	302	302
	DUMMY_SOCIALSC	302	302	302	302

Table H11.2 correlations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.644a	.415	.411	.76252

a. Predictors: (Constant), DUMMY_SOCIALSC, DUMMYNATURAL

Table H11.3 a

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.644a	.415	.411	.76252

a. Predictors: (Constant), DUMMYNATURAL, DUMMYPROFSSIOAL&APPLIED

Table H11.3 b

ANOVAb

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	123.255	2	61.627	105.993	.000a
	Residual	173.848	299	.581		
	Total	297.103	301			

a. Predictors: (Constant), DUMMY_SOCIALSC, DUMMYNATURAL

b. Dependent Variable: A.PU

Table H11.4a

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	123.255	2	61.627	105.993	.000[a]
	Residual	173.848	299	.581		
	Total	297.103	301			

a. Predictors: (Constant), DUMMYNATURAL, DUMMYPROFSSIOAL&APPLIED
b. Dependent Variable: A.PU

Table H11.4b

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	5.423	.074		73.222	.000					
DUMMYNATURAL	.363	.105	.174	3.455	.001	.434	.196	.153	.770	1.298
DUMMY_SOCIALSC	-1.172	.109	-.542	-10.756	.000	-.626	-.528	-.476	.770	1.298

a. Dependent Variable: A.PU

Table H11.5a **Coefficients**[a]

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	4.251	.080		53.181	.000					
DUMMYPROFSSIOAL&APPLIED	1.172	.109	.564	10.756	.000	.168	.528	.476	.712	1.405
DUMMYNATURAL	1.535	.109	.737	14.054	.000	.434	.631	.622	.712	1.405

a. Dependent Variable: A.PU

Table H11.5b

Descriptive Statistics

Dependent Variable:A.PU

specialization	Mean	Std. Deviation	N
Natural & formal Sc	5.7857	.64081	105
Profesional & apllied	5.4230	.70941	106
Social Sc	4.2509	.93273	91
Total	5.1959	.99351	302

Table H11.6

Tests of Between-Subjects Effects

Dependent Variable:A.PU

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	123.255[a]	2	61.627	105.993	.000
Intercept	7980.784	1	7980.784	13726.103	.000
specialization	123.255	2	61.627	105.993	.000
Error	173.848	299	.581		
Total	8450.361	302			
Corrected Total	297.103	301			

a. R Squared = .415 (Adjusted R Squared = .411)

Table H11.7 **Univariate Analysis**

A.PU
LSD

(I) specialization	(J) specialization	Mean Difference (I-J)	Std. Error	Sig.
Natural & formal Sc	Profesional & apllied	.3628*	.10499	.001
	Social Sc	1.5348*	.10921	.000
Profesional & apllied	Natural & formal Sc	-.3628*	.10499	.001
	Social Sc	1.1720*	.10897	.000
Social Sc	Natural & formal Sc	-1.5348*	.10921	.000
	Profesional & apllied	-1.1720*	.10897	.000

Table (H11.8) **Post Hoc Tests**

Descriptive Statistics

	Mean	Std. Deviation	N
A.PE	5.3554	1.03120	302
DUMMYPROFSSIOAL&APPLIED	.3510	.47807	302
DUMMYNATURAL	.3477	.47702	302
DUMMY_SOCIALSC	.3013	.45959	302

Table H12.1

Correlations

		A.PE	DUMMYPROFSSIOAL&APPLIED	DUMMYNATURAL	DUMMY_SOCIALSC
Pearson Correlation	A.PE	1.000	.184	.408	-.615
	DUMMYPROFSSIOAL&APPLIED	.184	1.000	-.537	-.483
	DUMMYNATURAL	.408	-.537	1.000	-.479
	DUMMY_SOCIALSC	-.615	-.483	-.479	1.000
Sig. (1-tailed)	A.PE	.	.001	.000	.000
	DUMMYPROFSSIOAL&APPLIED	.001	.	.000	.000
	DUMMYNATURAL	.000	.000	.	.000
	DUMMY_SOCIALSC	.000	.000	.000	.
N	A.PE	302	302	302	302
	DUMMYPROFSSIOAL&APPLIED	302	302	302	302
	DUMMYNATURAL	302	302	302	302
	DUMMY_SOCIALSC	302	302	302	302

Table (12.2) correlation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.628[a]	.394	.390	.80523

a. Predictors: (Constant), DUMMY_SOCIALSC, DUMMYNATURAL

Table (12.3a)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.628[a]	.394	.390	.80523

a. Predictors: (Constant), DUMMYNATURAL, DUMMYPROFSSIOAL&APPLIED

Table (12.3b)

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	126.203	2	63.101	97.318	.000[a]
	Residual	193.872	299	.648		
	Total	320.075	301			

a. Predictors: (Constant), DUMMY_SOCIALSC, DUMMYNATURAL

b. Dependent Variable: A.PE

Table (12.4a) ANOVA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	126.203	2	63.101	97.318	.000[a]
	Residual	193.872	299	.648		
	Total	320.075	301			

a. Predictors: (Constant), DUMMYNATURAL, DUMMYPROFSSIOAL&APPLIED

b. Dependent Variable: A.PE

Table (12.4b) ANOVA

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	5.613	.078		71.770	.000				5.613	
DUMMYNATURAL	.317	.111	.147	2.859	.005	.408	.163	.129	.317	1.298
DUMMY_SOCIALSC	-1.221	.115	-.544	-10.613	.000	-.615	-.523	-.478	-1.221	1.298

a. Dependent Variable: A.PE

Table (12.5a) Coefficients

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	4.392	.084		52.030	.000					
DUMMYNATURAL	1.221	.115	.566	10.613	.000	.184	.523	.478	.712	1.298
DUMMY_SOCIALSC	1.538	.115	.712	13.338	.000	.408	.611	.600	.712	1.298

a. Dependent Variable: A.PE

Table (12.5b) Coefficients

Descriptive Statistics

Dependent Variable:A.PE

specialization	Mean	Std. Deviation	N
Natural & formal Sc	5.9302	.63624	105
Profesional & appllied	5.6132	.83715	106
Social Sc	4.3919	.93207	91
Total	5.3554	1.03120	302

Table (12.6) Mean statistics

Tests of Between-Subjects Effects

Dependent Variable:A.PE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	126.203[a]	2	63.101	97.318	.000
Intercept	8479.510	1	8479.510	13077.542	.000
specialization	126.203	2	63.101	97.318	.000
Error	193.872	299	.648		
Total	8981.556	302			
Corrected Total	320.075	301			

a. R Squared = .394 (Adjusted R Squared = .390)

Table (12.7) Univariate Analysis

Multiple Comparisons

A.PE
LSD

(I) specialization	(J) specialization	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Natural & formal Sc	Profesional & copllied	.3170*	.11087	.005	.0988	.5351
	Social Sc	1.5382*	.11533	.000	1.3113	1.7652
Profesional & copllied	Natural & formal Sc	-.3170*	.11087	.005	-.5351	-.0988
	Social Sc	1.2213*	.11508	.000	.9948	1.4477
Social Sc	Natural & formal Sc	-1.5382*	.11533	.000	-1.7652	-1.3113
	Profesional & copllied	-1.2213*	.11508	.000	-1.4477	-.9948

Based on observed means.
The error term is Mean Square(Error) = .648.
*. The mean difference is significant at the .05 level.

Table (12.8) Post Hoc

Descriptive Statistics

	Mean	Std. Deviation	N
A.PU	5.1959	.99351	302
A.JR	4.5083	1.71976	302

Table (H13.1) Mean statistics

Correlations

		A.PU	A.JR
Pearson Correlation	A.PU	1.000	.506
	A.JR	.506	1.000
Sig. (1-tailed)	A.PU	.	.000
	A.JR	.000	.
N	A.PU	302	302
	A.JR	302	302

Table (13.2) **Correlations**

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.506[a]	.256	.253	.85851

a. Predictors: (Constant), A.JR

Table (H13.3) regression

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	75.990	1	75.990	103.102	.000[a]
	Residual	221.113	300	.737		
	Total	297.103	301			

a. Predictors: (Constant), A.JR

b. Dependent Variable: A.PU

Table (13.4) ANOVA

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	3.879	.139		27.943	.000					
A.JR	.292	.029	.506	10.154	.000	.506	.506	.506	1.000	1.000

a. Dependent Variable: A.PU

Table (13.5) Coefficients

Descriptive Statistics

	Mean	Std. Deviation	N
A.PU	5.1959	.99351	302
A.SE	5.3416	.93624	302

Table (H14.1) Mean

Correlations

		A.PU	A.SE
Pearson Correlation	A.PU	1.000	.696
	A.SE	.696	1.000
Sig. (1-tailed)	A.PU	.	.000
	A.SE	.000	.
N	A.PU	302	302
	A.SE	302	302

Table (14.2) correlations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.696[a]	.484	.482	.71473

a. Predictors: (Constant), A.SE

Table (14.3)

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	143.849	1	143.849	281.590	.000[a]
	Residual	153.254	300	.511		
	Total	297.103	301			

a. Predictors: (Constant), A.SE

b. Dependent Variable: A.PU

Table (14.4) ANOVA

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	1.252	.239		5.246	.000					
A.SE	.738	.044	.696	16.781	.000	.696	.696	.696	1.000	1.000

a. Dependent Variable: A.PU

Table (14.5) **Coefficients[a]**

Descriptive Statistics

	Mean	Std. Deviation	N
A.PE	5.3554	1.03120	302
A.SE	5.3416	.93624	302

Table (15.1) Mean

Correlations

		A.PE	A.SE
Pearson Correlation	A.PE	1.000	.693
	A.SE	.693	1.000
Sig. (1-tailed)	A.PE	.	.000
	A.SE	.000	.
N	A.PE	302	302
	A.SE	302	302

Table (15.2) Correlations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.693[a]	.480	.478	.74485

a. Predictors: (Constant), A.SE

Table (15.3) Regression

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	153.636	1	153.636	276.921	.000[a]
	Residual	166.440	300	.555		
	Total	320.075	301			

a. Predictors: (Constant), A.SE

b. Dependent Variable: A.PE

Table (15.4) ANOV

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	1.279	.249		5.145	.000					
A.SE	.763	.046	.693	16.641	.000	.693	.693	.693	1.000	1.000

a. Dependent Variable: A.PE

Table (15.5) **Coefficients[a]**

Descriptive Statistics

	Mean	Std. Deviation	N
A.PU	5.1959	.99351	302
EXP	2.1490	1.10615	302

Table (16.1) Mean

Correlations

		A.PU	EXP
Pearson Correlation	A.PU	1.000	.199
	EXP	.199	1.000
Sig. (1-tailed)	A.PU	.	.000
	EXP	.000	.
N	A.PU	302	302
	EXP	302	302

Table (16.2) Correlations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.199[a]	.040	.036	.97524

a. Predictors: (Constant), EXP

Table (16.3) Regression

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.774	1	11.774	12.379	.001[a]
	Residual	285.329	300	.951		
	Total	297.103	301			

a. Predictors: (Constant), EXP

b. Dependent Variable: A.PU

Table (16.4) ANOVA

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	4.812	.123		39.189	.000					
EXP	.179	.051	.199	3.518	.001	.199	.199	.199	1.000	1.000

a. Dependent Variable: A.PU

Table (16.5) Coefficients

Descriptive Statistics

	Mean	Std. Deviation	N
A.PU	5.1959	.99351	302
A.CX	3.9117	1.27341	302

Table (17.1) Mean

Correlations

		A.PU	A.CX
Pearson Correlation	A.PU	1.000	-.490
	A.CX	-.490	1.000
Sig. (1-tailed)	A.PU	.	.000
	A.CX	.000	.
N	A.PU	302	302
	A.CX	302	302

Table (17.2) Correlations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.490[a]	.240	.237	.86773

a. Predictors: (Constant), A.CX

Table (17.3) Regression

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	71.218	1	71.218	94.585	.000[a]
	Residual	225.885	300	.753		
	Total	297.103	301			

a. Predictors: (Constant), A.CX

b. Dependent Variable: A.PU

Table (17.4) ANOVA

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	6.690	.162		41.413	.000					
A.CX	-.382	.039	-.490	-9.725	.000	-.490	-.490	-.490	1.000	1.000

a. Dependent Variable: A.PU

Table (17.5) Coefficien

14 APPENDIX C

14.1 HYPOTHESES ANALYSIS (MULTIPLE REGRESSION)

Descriptive Statistics

	Mean	Std. Deviation	N
A.PU	5.1959	.99351	302
dummygender	.5497	.49835	302
A.PE	5.3554	1.03120	302
DUMMYNATURAL	.3477	.47702	302
DUMMYPROFSSIOAL&APPLIED	.3510	.47807	302
A.SN	6.2252	.69691	302
A.JR	4.5083	1.71976	302
A.SE	5.3416	.93624	302
A.CX	3.9117	1.27341	302
EXP	2.1490	1.10615	302

Table c.1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.865[a]	.749	.741	.50559
2	.865[b]	.749	.742	.50490

a. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, A.JR, A.PE, DUMMYNATURAL

b. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, A.SE, A.CX, A.JR, A.PE, DUMMYNATURAL

Table c.2

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	222.461	9	24.718	96.697	.000[a]
	Residual	74.642	292	.256		
	Total	297.103	301			
2	Regression	222.410	8	27.801	109.057	.000[b]
	Residual	74.693	293	.255		
	Total	297.103	301			

a. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, A.JR, A.PE, DUMMYNATURAL

b. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, A.SE, A.CX, A.JR, A.PE, DUMMYNATURAL

c. Dependent Variable: A.PU

Table c.3

Correlations

		A.PU	dummygender	A.PE	DUMMYNATURAL	DUMMYPROFSSIOAL&APPLIED	A.SN	A.JR	A.SE	A.CX	EXP
Pearson Correlation	A.PU	1.000	-.047	.821	.434	.168	.396	.506	.696	-.490	.199
	dummygender	-.047	1.000	-.114	-.122	.150	.035	-.170	-.038	.213	.128
	A.PE	.821	-.114	1.000	.408	.184	.551	.526	.693	-.446	.063
	DUMMYNATURAL	.434	-.122	.408	1.000	-.537	.228	.673	.390	-.394	.103
	DUMMYPROFSSIOAL&APPLIED	.168	.150	.184	-.537	1.000	.106	-.024	.156	.006	.008
	A.SN	.396	.035	.551	.228	.106	1.000	.313	.394	-.252	-.044
	A.JR	.506	-.170	.526	.673	-.024	.313	1.000	.496	-.501	.294
	A.SE	.696	-.038	.693	.390	.156	.394	.496	1.000	-.499	.085
	A.CX	-.490	.213	-.446	-.394	.006	-.252	-.501	-.499	1.000	-.282
	EXP	.199	.128	.063	.103	.008	-.044	.294	.085	-.282	1.000
Sig. (1-tailed)	A.PU	.	.207	.000	.000	.002	.000	.000	.000	.000	.000
	dummygender	.207	.	.024	.017	.005	.274	.002	.254	.000	.013
	A.PE	.000	.024	.	.000	.001	.000	.000	.000	.000	.137
	DUMMYNATURAL	.000	.017	.000	.	.000	.000	.000	.000	.000	.037
	DUMMYPROFSSIOAL&APPLIED	.002	.005	.001	.000	.	.033	.341	.003	.461	.448
	A.SN	.000	.274	.000	.000	.033	.	.000	.000	.000	.225
	A.JR	.000	.002	.000	.000	.341	.000	.	.000	.000	.000
	A.SE	.000	.254	.000	.000	.003	.000	.000	.	.000	.069
	A.CX	.000	.000	.000	.000	.461	.000	.000	.000	.	.000
	EXP	.000	.013	.137	.037	.448	.225	.000	.069	.000	.
N	A.PU	302	302	302	302	302	302	302	302	302	302
	dummygender	302	302	302	302	302	302	302	302	302	302
	A.PE	302	302	302	302	302	302	302	302	302	302
	DUMMYNATURAL	302	302	302	302	302	302	302	302	302	302
	DUMMYPROFSSIOAL&APPLIED	302	302	302	302	302	302	302	302	302	302
	A.SN	302	302	302	302	302	302	302	302	302	302
	A.JR	302	302	302	302	302	302	302	302	302	302
	A.SE	302	302	302	302	302	302	302	302	302	302
	A.CX	302	302	302	302	302	302	302	302	302	302
	EXP	302	302	302	302	302	302	302	302	302	302

Table c.4

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Correlations Zero-order	Correlations Partial	Correlations Part	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	1.525	.380		4.014	.000					
	dummygender	.029	.065	.015	.446	.656	-.047	.026	.013	.809	1.236
	A.PE	.607	.047	.630	12.946	.000	.821	.604	.380	.363	2.754
	DUMMYNATURAL	.570	.131	.274	4.366	.000	.434	.248	.128	.219	4.567
	DUMMYPROFSSIOAL&APPLIED	.358	.099	.172	3.623	.000	.168	.207	.106	.380	2.632
	A.SN	-.099	.051	-.070	-1.936	.050	.396	-.113	-.057	.667	1.498
	A.JR	-.083	.030	-.143	-2.736	.007	.506	-.158	-.080	.313	3.193
	A.SE	.191	.047	.180	4.100	.000	.696	.233	.120	.448	2.233
	A.CX	-.052	.030	-.067	-1.767	.078	-.490	-.103	-.052	.596	1.679
	EXP	.119	.030	.133	3.967	.000	.199	.226	.116	.768	1.302
2	(Constant)	1.510	.378		3.996	.000					
	A.PE	.604	.046	.627	13.062	.000	.821	.607	.383	.373	2.683
	DUMMYNATURAL	.582	.127	.280	4.571	.000	.434	.258	.134	.229	4.361
	DUMMYPROFSSIOAL&APPLIED	.369	.096	.178	3.856	.000	.168	.220	.113	.404	2.473
	A.SN	-.095	.050	-.067	-1.891	.060	.396	-.110	-.055	.686	1.458
	A.JR	-.086	.029	-.149	-2.932	.004	.506	-.169	-.086	.332	3.009
	A.SE	.193	.046	.182	4.177	.000	.696	.237	.122	.453	2.208
	A.CX	-.049	.029	-.063	-1.713	.088	-.490	-.100	-.050	.629	1.590
	EXP	.123	.029	.137	4.260	.000	.199	.242	.125	.831	1.203

a. Dependent Variable: A.PU

Table c.5

Descriptive Statistics

	Mean	Std. Deviation	N
A.PE	5.3554	1.03120	302
dummygender	.5497	.49835	302
DUMMYNATURAL	.3477	.47702	302
DUMMYPROFSSIOAL&APPLIED	.3510	.47807	302
A.SN	6.2252	.69691	302
A.JR	4.5083	1.71976	302
A.SE	5.3416	.93624	302
A.CX	3.9117	1.27341	302
EXP	2.1490	1.10615	302

Table c.6

Correlations

		A.PE	dummygender	DUMMYNATURAL	DUMMYPROFSSIOAL&APPLIED	A.SN	A.JR	A.SE	A.CX	EXP
Pearson Correlation	A.PE	1.000	-.114	.408	.184	.551	.526	.693	-.446	.063
	dummygender	-.114	1.000	-.122	.150	.035	-.170	-.038	.213	.128
	DUMMYNATURAL	.408	-.122	1.000	-.537	.228	.673	.390	-.394	.103
	DUMMYPROFSSIOAL&APPLIED	.184	.150	-.537	1.000	.106	-.024	.156	.006	.008
	A.SN	.551	.035	.228	.106	1.000	.313	.394	-.252	-.044
	A.JR	.526	-.170	.673	-.024	.313	1.000	.496	-.501	.294
	A.SE	.693	-.038	.390	.156	.394	.496	1.000	-.499	.085
	A.CX	-.446	.213	-.394	.006	-.252	-.501	-.499	1.000	-.282
	EXP	.063	.128	.103	.008	-.044	.294	.085	-.282	1.000
Sig. (1-tailed)	A.PE	.	.024	.000	.001	.000	.000	.000	.000	.137
	dummygender	.024	.	.017	.005	.274	.002	.254	.000	.013
	DUMMYNATURAL	.000	.017	.	.000	.000	.000	.000	.000	.037
	DUMMYPROFSSIOAL&APPLIED	.001	.005	.000	.	.033	.341	.003	.461	.448
	A.SN	.000	.274	.000	.033	.	.000	.000	.000	.225
	A.JR	.000	.002	.000	.341	.000	.	.000	.000	.000
	A.SE	.000	.254	.000	.003	.000	.000	.	.000	.069
	A.CX	.000	.000	.000	.461	.000	.000	.000	.	.000
	EXP	.137	.013	.037	.448	.225	.000	.069	.000	.
N	A.PE	302	302	302	302	302	302	302	302	302
	dummygender	302	302	302	302	302	302	302	302	302
	DUMMYNATURAL	302	302	302	302	302	302	302	302	302
	DUMMYPROFSSIOAL&APPLIED	302	302	302	302	302	302	302	302	302
	A.SN	302	302	302	302	302	302	302	302	302
	A.JR	302	302	302	302	302	302	302	302	302
	A.SE	302	302	302	302	302	302	302	302	302
	A.CX	302	302	302	302	302	302	302	302	302
	EXP	302	302	302	302	302	302	302	302	302

Table c.7

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.798[a]	.637	.627	.62979
2	.798[b]	.637	.628	.62872
3	.798[c]	.637	.629	.62782
4	.798[d]	.636	.630	.62737

a. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, A.JR, DUMMYNATURAL

b. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, DUMMYNATURAL

c. Predictors: (Constant), DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, DUMMYNATURAL

d. Predictors: (Constant), DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, DUMMYNATURAL

Table c.8

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	203.862	8	25.483	64.248	.000[a]
	Residual	116.213	293	.397		
	Total	320.075	301			
2	Regression	203.859	7	29.123	73.673	.000[b]
	Residual	116.216	294	.395		
	Total	320.075	301			
3	Regression	203.799	6	33.966	86.175	.000[c]
	Residual	116.277	295	.394		
	Total	320.075	301			
4	Regression	203.571	5	40.714	103.441	.000[d]
	Residual	116.504	296	.394		
	Total	320.075	301			

a. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, A.JR, DUMMYNATURAL

b. Predictors: (Constant), EXP, DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, DUMMYNATURAL

c. Predictors: (Constant), DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, A.CX, DUMMYNATURAL

d. Predictors: (Constant), DUMMYPROFSSIOAL&APPLIED, A.SN, dummygender, A.SE, DUMMYNATURAL

e. Dependent Variable: A.PE

Table c.9

Coefficients[a]

Model	Unstandardize		Standardize			Correlations			Collinearity	
	B	Std.	Beta	t	Sig.	Zer	Partia	Part	Tolera	VIF
1 (Constant)	.059	.473		.125	.901					
dummygender	-.223	.080	-.108	-	.006	-	-.161	-.098	.830	1.204
DUMMYNATURAL	.653	.158	.302	4.13	.000	.408	.235	.145	.232	4.315
DUMMYPROFSSIOAL&APPLIE	.582	.118	.270	4.92	.000	.184	.276	.173	.411	2.431
A.SN	.434	.058	.293	7.42	.000	.551	.398	.261	.793	1.261
A.JR	.003	.038	.006	.092	.927	.526	.005	.003	.313	3.193
A.SE	.436	.052	.396	8.37	.000	.693	.439	.295	.555	1.802
A.CX	-.022	.037	-.027	-.591	.555	-	-.034	-.021	.596	1.677
EXP	.013	.037	.014	.337	.736	.063	.020	.012	.768	1.301
2 (Constant)	.064	.469		.136	.892					
dummygender	-.225	.077	-.109	-	.004	-	-.167	-.102	.883	1.133
DUMMYNATURAL	.663	.114	.307	5.79	.000	.408	.320	.204	.441	2.266
DUMMYPROFSSIOAL&APPLIE	.588	.104	.272	5.64	.000	.184	.313	.199	.531	1.883
A.SN	.435	.058	.294	7.49	.000	.551	.400	.263	.803	1.245
A.SE	.436	.052	.396	8.40	.000	.693	.440	.295	.556	1.798
A.CX	-.022	.037	-.027	-.601	.548	-	-.035	-.021	.600	1.665
EXP	.014	.035	.015	.390	.697	.063	.023	.014	.862	1.160
3 (Constant)	.130	.437		.299	.765					
dummygender	-.219	.075	-.106	-	.004	-	-.166	-.102	.925	1.081
DUMMYNATURAL	.665	.114	.308	5.82	.000	.408	.321	.205	.442	2.262
DUMMYPROFSSIOAL&APPLIE	.589	.104	.273	5.66	.000	.184	.313	.199	.531	1.882
A.SN	.432	.057	.292	7.51	.000	.551	.401	.264	.817	1.224
A.SE	.435	.052	.395	8.40	.000	.693	.440	.295	.558	1.793
A.CX	-.027	.035	-.033	-.760	.448	-	-.044	-.027	.664	1.505
4 (Constant)	-.056	.361		-.154	.878					
dummygender	-.231	.074	-.112	-	.002	-	-.179	-.110	.971	1.030
DUMMYNATURAL	.686	.111	.317	6.19	.000	.408	.339	.217	.469	2.132
DUMMYPROFSSIOAL&APPLIE	.597	.103	.277	5.79	.000	.184	.319	.203	.538	1.860
A.SN	.434	.057	.293	7.56	.000	.551	.403	.265	.819	1.221
A.SE	.447	.049	.406	9.10	.000	.693	.468	.319	.618	1.617

a. Dependent Variable: A.PE

Table c.10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.669[a]	.447	.444	.60043

Predictors: (Constant), A.PE, A.PU

Table c.11

Coefficients[a]

Model	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Correlations Zero-order
1 (Constant)	2.578	.192		13.416	.000	
A.PU	.337	.061	.416	5.521	.000	.649
A.PE	.222	.059	.284	3.777	.000	.625

a. Dependent Variable: A.ATT

Table C12

ANOVAb

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	123.417	3	41.139	259.219	.000[a]
	Residual	47.294	298	.159		
	Total	170.711	301			

a. Predictors: (Constant), A.ATT, A.PE, A.PU

Table (c13)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.850[a]	.723	.720	.39838

a. Predictors: (Constant), A.ATT, A.PE, A.PU

Table (c14) model summery

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Correlations Zero-order	Correlations Partial	Correlations Part	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	1.431	.161		8.865	.000					
	A.PU	.092	.042	.121	2.167	.031	.694	.125	.066	.296	3.379
	A.PE	.171	.040	.234	4.287	.000	.700	.241	.131	.311	3.212
	A.ATT	.548	.038	.585	14.273	.000	.811	.637	.435	.553	1.810

a. Dependent Variable: A.BI

Table C16

Correlations

		A.BI	A.PU	A.PE	A.ATT
Pearson Correlation	A.BI	1.000	.694	.700	.811
	A.PU	.694	1.000	.821	.649
	A.PE	.700	.821	1.000	.625
	A.ATT	.811	.649	.625	1.000
Sig. (1-tailed)	A.BI	.	.000	.000	.000
	A.PU	.000	.	.000	.000
	A.PE	.000	.000	.	.000
	A.ATT	.000	.000	.000	.
N	A.BI	302	302	302	302
	A.PU	302	302	302	302
	A.PE	302	302	302	302
	A.ATT	302	302	302	302

Table (c17) correlation

15 APPENDIX D

15.1 SURVEY INSTRUMENT

Survey Instrument
Questionnaire

Questionnaire Cover letter

An Investigation into the Influence of Learning Styles and other Factors Affecting Students' Perception of Virtual Learning Environments

Dear Al-Fateh University Students

We need your input to help us with an important research study on Blackboard system use and acceptance of use in your university. The study is conducted by Mr. Khaled Swesi, a former lecturer of computer science department in engineering school, and now PhD candidate at De Montfort University UK.

The purpose of this research is to assess the current level of acceptance or rejection of such Technology based on the learning styles. We need you input to give us chance to evaluate these issue and discover the perception and attitude towards these technology in order to enhance the system services in the university and help decision makers to make the right decision for smooth implementation. Please be assured that your responses will be kept in strictly confidential and you are not required to indicate your name. Please use your first inclination when answering the questions. There are three parts of questions **and** it takes about 15 minutes to complete the questions. Please do not hesitate to contact me by email at

kswesi@dmu.ac.uk.

Thank you for participating in this research.

Your response to this Questionnaire is STRICTLY anonymous.

Khaled Swesi
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Faculty of Computing Sciences and Engineering,
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Part 1: Demographical Information

1. Gender: **Male** **Female**

Male	Female

2. Year of study on current University course

3. Education Bachelor (BSc/BA) Master

Bachelor (BSc/BA)	Master

4. Specialisation (major)

Please indicate your specialisation

Natural and Formal Science	
Professions and Applied Science	
Social Science and humanities	

6. Number of year using the Blackboard's Course Management System(BCMS).

PART 2: Perception of BCMS Use

Please indicate your level of agreement or disagreement from the following statements.

Note: **BCMS** is Blackboard Course Management System which is part of VLE

(SD) ---1----- -----2------ ------3------ -----4------ -----5------ ----6----- ----7----- (SA)
Strongly Disagree disagree somewhat Disagree Neutral Somewhat Agree Agree Strongly Agree

1. Perceived Usefulness.

	SD			Neutral			SA
1. Using the BCMS allows me to accomplish tasks more quickly.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. Using the BCMS improves my performance.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. Using the BCMS makes it easier to perform my study.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. Using the BCMS in my study increases my productivity.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. Using the BCMS can enhance my effectiveness.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6. I find the BCMS useful in my school.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

2. Perceived Ease of Use

	SD			Neutral			SA
1. It is easy for me to learn how to use the BCMS.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. I find it easy to get the BCMS to do what I want it to do.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. Interaction using the BCMS is clear and understandable.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. I think interact is flexible using the BCMS.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. I think becoming skilful in using the BCMS is easy.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6. The BCMS is easy to use.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

3. Subjective norms

	SD			Neutral			SA
1. People who influence my behaviour think that I should use the BCMS.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. People who are important to me think that I should use the BCMS.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

4. Relevance

	SD			Neutral			SA
1. The BCMS is very important for my study.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. The BCMS is relevant to my study.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

5. Self-efficacy

	SD			Neutral			SA
1. I expect to become very proficient in the use of BCMS.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. I feel confident that I can use the BCMS.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. Using the BCMS is probably something I will be good at.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. I believe that surfing the BCMS is a skill I can easily use.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. I could complete the job using the BCMS, if someone else had helped me get started.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6. I believe that my BCMS skills will improve substantially through training.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

6. Experience

	SD			Neutral			SA
1. I have a great deal of experience using the BCMS.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

7. Complexity

	SD			Neutral			SA
1. Using the BCMS can take up too much of my time.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. I find it difficult to integrate the job into my existing work.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. Using the BCMS exposes me to the risk of computer breakdowns and loss of data.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

8. Attitude

	SD			Neutral			SA
1. Using the BCMS in the university is a good idea.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. Using the BCMS in the university is wise idea.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. I like using the BCMS in my study.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. I find a lot of enjoyment when using the BCMS.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. Using the BCMS satisfy me.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

9. Intended Behaviour.

	SD			Neutral			SA
1. I always try to use the BCMS to undertake tasks whenever it is relevant.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. I always try to use the BCMS in as much as possible.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. I will use the BCMS during my study in the future.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. I intend to continue using the BCMS.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. I expect my use of the BCMS will increase in the future.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Part 3 Learning style Inventory

This Inventory describes ways in which you learn and how you deal with ideas and day-to-day situations in your life. Below are 12 sentences with a choice of endings. Evaluate the endings for each sentence according to how well you think each one fits with how you would go about learning something. Try to recall some recent situations where you had to learn something new, such as at school. Then, using the spaces provided, rank a "4" for the sentence ending that describes how you learn best, down to a "1" for the sentence ending that seems least like way you learn. Be sure to rank all the endings for each sentence unit.

Remember **4**= most like you, **3**= second most like you, **2**= third most like you, **1**= least like you

no	**Items**	A		B		C		D	
1	When learn		I like to deal with my feelings		I like to think about ideas		I like to be doing things		I like to watch and listen
2	I learn best when		I listen and watch carefully		I rely on logical things		I trust my hunches and feelings		I work hard to get things done
3	When I am learning		I tend to reason things out		I am responsible about things		I am quiet and reserved		I have strong feelings and reactions
4	I learn by		Feeling		Doing		Watching		Thinking
5	When I learn		I am open to new experiences		I look at all sides of issues		I like to analyze things, break them down into their parts		I like to try things out
6	When I am learning		I am an observing person		I am an active person		I am an intuitive person		I am a logical person
7	I learn best from		Observation		Personal relationships		Rational theories		A chance to try out and practice.
8	When I learn		I like to see results from my work.		I like ideas and theories.		I take my time before acting.		I feel personally involved in things
9	I learn best when		I rely on my observation.		I rely on my feelings.		I can try things out for myself.		I rely on my ideas.
10	When I am learning		I am reserved person.		I am an accepting person.		I am a responsible person.		I am a rational person.
11	When I learn		I get involved.		I like to observe		I evaluate things.		I like to be active.
12	I learn best when		I analyze ideas.		I am receptive and open-minded.		I am careful.		I am practical.

Thank you very much for your cooperation and participation.

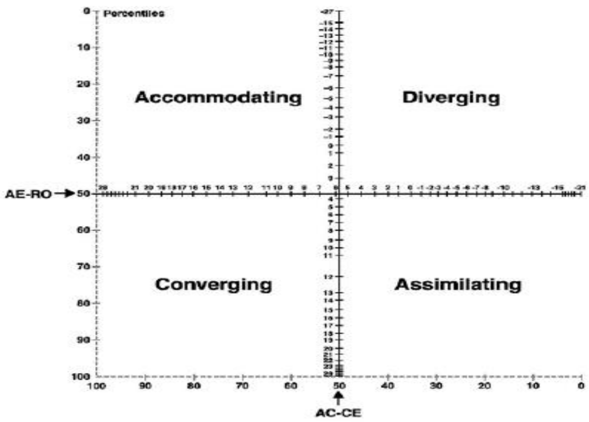
For more information on How to calculate learning style
The four learning styles CE, RO, AC, and AE each has ten items as shown in tables below, the ten items represent one learning style as described by Kolb (2000).

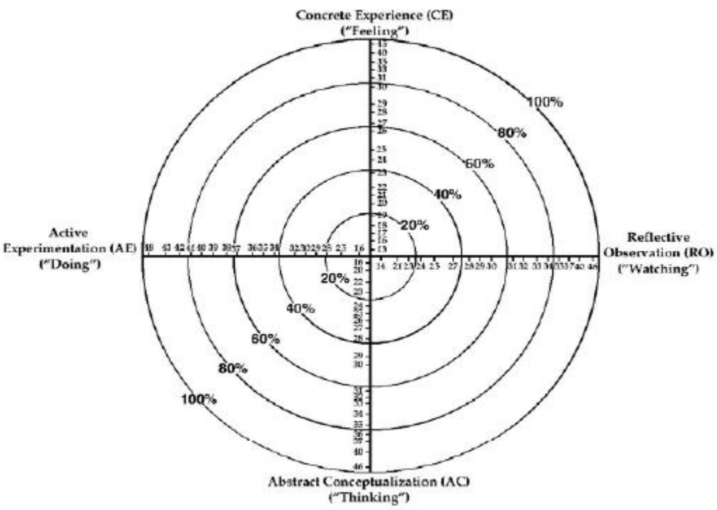
CE Total=	1A+2C+3D+4A+5A+6C+7B+8D+9B+10B+11A+12B

RO Total=	1D+2A+3C+4C+5B+6A+7A+8C+9A+10A+11B+12C

AC Total=	1B+2B+3A+4D+5C+6D+7C+8B+9D+10D+11C+12A

AE Total=	1C+2D+3B+4B+5D+6B+7D+8A+9C+10C+11D+12D





16 APPENDIX E

16.1 CERTIFICATE OF ETHICAL APPROVAL

dmu.ac.uk
DE MONTFORT UNIVERSITY
LEICESTER

1 December 2010

Dear Khaled Swesi

I am pleased to inform you that the Faculty Research Ethics Committee held on Thursday 28 October 2010 considered your Application to Gain Ethical Approval for Research Degree Activities.

TRACKING Number: 0910/062

TITLE: The Perception And Attitude Of Students And The Impact Of Learning Styles On Acceptance Blackboard System, Modify Technology Acceptance Model

OUTCOME: Final Approval Granted 8 June 2010

Presented to FHREC: Ratified 28/10/10

If you require any further information, please do not hesitate to contact me.

Yours sincerely,

Elaine Aspell
Faculty Research Student Coordinator
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